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Risk Assessment Models for Land Application of Municipal Sludges (RAMMS Version 3.0). Volume 1 Draft Complete Documentation of the System/User Manual

Science Applications International Corp.
McLean, VA

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A user-friendly manual to facilitate operation of the RAMS model for the terrestrial pathways in land application and distribution and marketing of sewage sludge under the proposed Part 503 regulations has been developed.

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DRAFT
COMPLETE DOCUMENTATION OF THE SYSTEM/USER MANUAL

FOR
THE RISK ASSESSMENT MODELS
FOR
LAND APPLICATION OF MUNICIPAL SLUDGES

(RAMMS Version 3.0)

VOLUME I

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U.S. Environmental Protection Agency
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401 M Street, S.W.
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Submitted by:

Science Applications International Corporation
8400 Westpark Drive
McLean, VA 22102

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I. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has developed a series of models for calculating the risks associated with the land application of municipal sludge. These models were used in the development of the Proposed Technical Sludge Regulation, and have been collected together in a single, user friendly computer program. This manual contains a basic description of the risk assessment models, explains how to use the computer program, and documents the code, input, and output data for the program.

This manual is not intended to be a stand-alone document. The technical basis for assessing risk for each pathway is contained in another EPA publication (ECAO-CIN-489). This document should be consulted for more complete information. This manual only presents summary information on the models, with cross-references to the more complete documentation, to assist in the use of the computer program and the interpretation of results.

The manual is organized in six chapters. The first chapter is a brief description to the risk assessment models as they are implemented by the program. The second chapter explains system requirements and how to install the program on appropriate systems. The third chapter explains how the program is structured and outlines options that can be invoked at different stages of execution. The fourth chapter steps through typical execution of the program, showing input screens and output screens that are encountered. The fifth chapter is the listing of the program code, and the sixth chapter is a listing of data files used by the program.

It is recommended that the first three chapters of this manual be scanned before starting the program, and that you step through the program using the fourth chapter as a guide before doing any major experimentation with your own data. This procedure will allow you to become familiar with various features and determine how to use the program most effectively for you purposes.

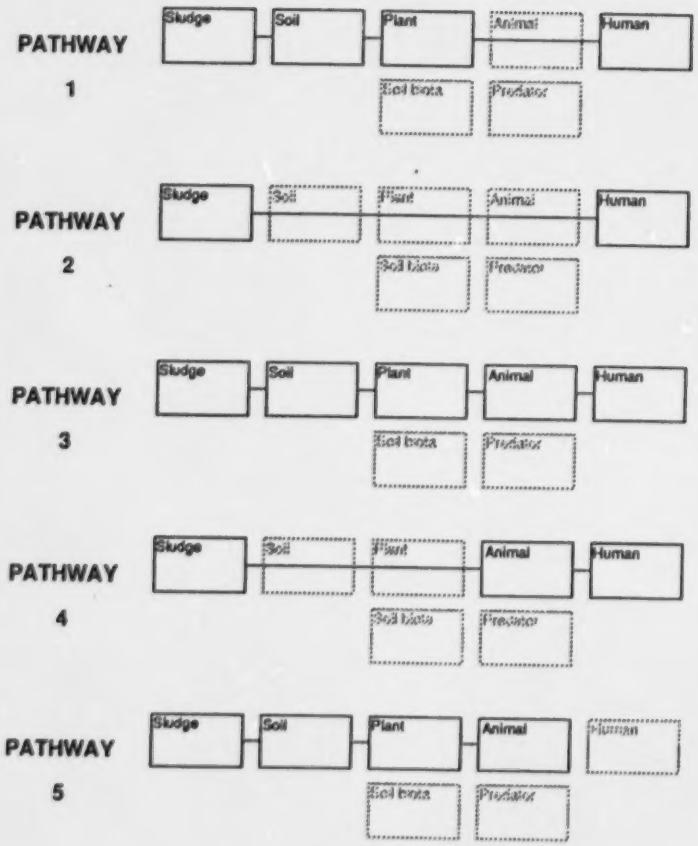
A. Model Description

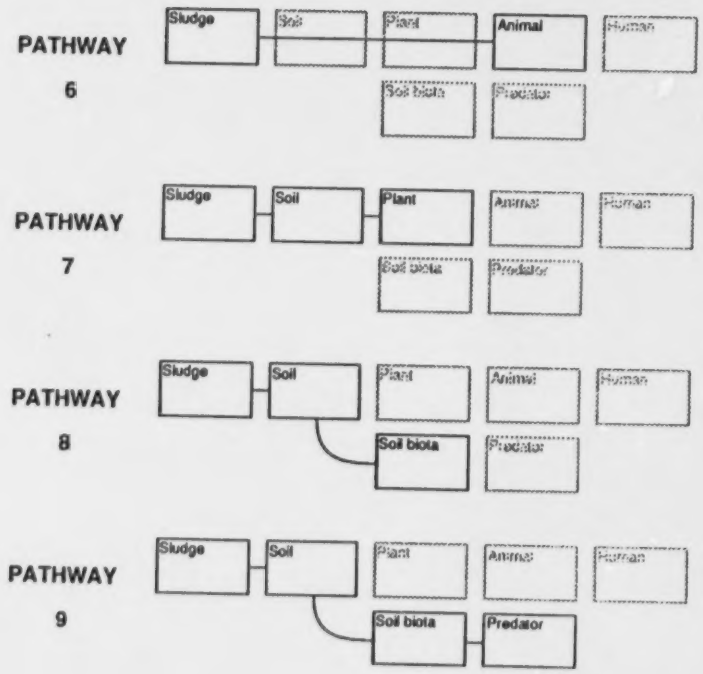
The risk assessment models covered by this manual assume that municipal sludge with specified characteristics is spread across a defined area of ground at a known rate once each year for a given number of years. The contaminants in the sludge are incorporated into the soil, and through physical and biological processes are moved from the primary site through the action of wind and surface runoff, or are transferred up the food chain. Risks associated with direct land application of sludge applied after distribution and marketing are both calculated.

Each pathway is considered independently of every other pathway (e.g., there is no attempt to ensure mass balance), but values of coefficients in equations that represent transfers or effects are forced to be consistent across pathways. For example, in each pathway where contaminants are taken up by a given plant species, the same equations and coefficients are used for uptake in each pathway.

Twelve pathways are considered in this program. Nine of these pathways are related to direct uptake of contaminants from sludge-amended soil and are presented in the figure on the following page. The risk targets are humans in pathways 1 through 4, herbivores in pathways 5 and 6, plants in pathway 7, soil biota in pathway 8, and soil biota predators in pathway 9. The other pathways relate to risks associated with wind-caused resuspension of sludge-amended soil particles (pathway 10), surface water contamination caused by surface runoff (pathway 11), and ground water contamination (pathway 12). Risk targets for these pathways include humans (inhalation of sludge-amended soil particles, pathway 10; drinking or sludge-contaminated surface waters, pathway 11; drinking of sludge-contaminated ground water, pathway 12), and aquatic life (pathway 11).

The computer program uses the models in the "inverse" mode, i.e., it calculates the maximum annual loading of contaminants (or maximum concentrations in sludge for a given loading) that can be land applied and still meet the risk criteria specified as input. These outputs are listed on a contaminant-by-contaminant basis, not on a whole sludge basis. The contaminant that would limit the application rate of sludge, and the actual sludge application rate associated with particular sludge contaminant concentrations are not directly calculated.





Land-based Risk Assessment Pathways For Determining Maximum Loadings for Land Application of Sludge

B. Model Formulation

The equations, variables, and sources of data that are implemented in the computer program are discussed in the EPA Office of Research and Development (ORD) document "Development of Risk Assessment Methodology for Land Application and Distribution and Marketing of Municipal Sludge" (ECAO-CIN-489). To assist in verifying that the equations and coefficients used in the computer implementation are consistent with the ORD document, the variables listed in the document, the variables used in the program, the units of the variables, a description of variables, and the first pathway in which each variable is used in the computer program are presented in the table on the following page. Since brief descriptions of each variable are listed in this table, it can also be used (with other sources of data) to determine whether the numerical ranges of variable values are consistent with their definitions.

The table is organized by the order in which the variables are presented by the program. The first input variables are those that are not contaminant-specific. These variables represent parameters that are generally used in more than one pathway, and they are presented by the program at the beginning of execution. Contaminant-specific variables that are used in more than one pathway (essentially the first four pathways) are presented next. The remaining variables are then presented.

Following the table is the second chapter, the chapter on program installation.

Program Variables, Documented Variables, Variable Description, and Program Screens Where Variables Can Be Changed.

Program Variable	Variable	Units	Description *Non-contaminant specific*	Pathway/screen where variable can be changed: NCS	CS *Contaminant specific* 1	2	3	4	5	6	7	8	9	10	11	12
BWC		kg	Body weight (child)	√												
SI	SI	g dry wt/day	Sludge ingested per day by humans	√												
BWA		kg	Body weight (adult; overrides default value of 70 kg; no variable specified)	√												
YREXP		yrs	Years of exposure (used to calculate EDA {exposure duration adjustment}; no variable specified)	√												
ASA	ASA	kg dry wt/ha	Annual sludge application rate	√												
SF2	SFq	dimensionless	Fraction of dietary intake of sludge for animal q exposed for more than 30 days	√												
LF	LI	mg dry wt/day	Dietary intake of sludge amended soil for humans	√												
LI	LI	g dry wt/day	Soil ingested per day by humans	√												
RE	RE	dimensionless	Relative effectiveness (relative absorbance of contaminant given its chemical state)	√												
SF1	SFq	dimensionless	Fraction of dietary intake of sludge for animal q exposed for less than 30 days	√												
RL	RLi	unitless	Risk level (1E-4 to 1E-7)	√												
TIERTIME	Ti	yrs	The time between the only or final application of sludge and when plants, animals, or humans are exposed	√												
LFTIME		yrs	Lifetime (overrides default value of 70 years; no variable specified)	√												
GU		yrs	Period of gardening use (overrides default value of 20 years; no variable specified)	√												
DEPTH		cm	Upper depth of surface area (overrides default value of 15 cm; no variable is documented)	√												
TBIA	TBIi	mg/day	Daily background intake of contaminant i (adult)		√											
K	SKi	1/year	Overall first order rate constant for the removal of contaminant i		√											
CARCIN		none	Carcinogen or noncarcinogen indicator (no variable specified; used to determine whether toxic or carcinogenic risk is calculated)		√											
ADI	ADIim	mg/kg/day	Acceptable daily intake of contaminant i		√											
RUD	RUDi	1/(mg/kg/day)	Human cancer potency for contaminant i		√											

Program Variables, Documented Variables, Variable Description, and Program Screens Where Variables Can Be Changed (continued)

Program Variable	Variable	Units	Description	NCS	CS 1	2	3	4	5	6	7	8	9	10	11	12
BLC	BLCi	mg/kg dry wt soil	Background soil concentration of contaminant i prior to any sludge application	√												
TBIC	TBIi	mg/day	Daily background intake of contaminant i (child)	√												
CPU	LCPUik(r)	(µg/g dry wt plant)/ (kg/ha)	Mean slope of concentration of contaminant i in vegetable k versus the concentration in the soil		√											
LCPU3	LCPUik(r)	(µg/g dry wt plant)/(kg/ha)	Mean slope of concentration of contaminant i in plant k versus the concentration in the soil				√									
AU3	HUi	(µg/g tissue)/(µg/g dry wt feed)	Mean slope of the concentration of contaminant i in animal tissue versus the concentration in feed				√									
AU4	HUi	(µg/g tissue)/(µg/g dry wt feed)	Mean slope of the concentration of contaminant i in animal tissue versus the concentration in feed					√								
LCPU5	LCPUik(r)	(µg/g dry wt plant)/(kg/ha)	Mean slope of concentration of contaminant i in plant k versus the concentration in the soil						√							
XTTFC	HTTFCiq	µg/g dry wt feed	Herbivore toxic threshold feed concentration for contaminant i for herbivore type q						√							
BPC	BPCik	µg/g	Background concentration of contaminant i in plant k						√							
HTTFC	HTTFCiq	µg/g dry wt feed	Herbivore toxic threshold feed concentration for contaminant i for herbivore type q							√						
PTLC	PTLCik	µg/g dry wt soil	Phytotoxic threshold soil concentration of inorganic or organic contaminant i in crop k								√					
LBTTLC	LBTTLCiv	µg/g dry wt soil	Soil biota toxic threshold soil concentration for contaminant i for soil biota type v									√				
CALBU	CALBUiv	µg/g dry wt tissue	Mean slope of concentration of contaminant i in soil biota v versus the concentration of contaminant i in the soil										√			
BLBC	BLBCi	µg/g	Background soil biota concentration of contaminant i										√			
PTTFCSC	PTTFCiw	µg/g dry wt feed	Predator toxic threshold feed concentration for contaminant i (soil contaminant, SC) and predator w										√			
IPAC	IPAC	g/m3	Inhalable particulate air concentration as given by INPUFF											√		
WVEL		m/s	Average surface wind velocity											√		
RIAC	RIACi	mg/m3	Reference inhalable air concentration for contaminant i											√		
VE	XRo	m3/sec	Event receiving water flow rate												√	
KZERO	ZKi	kg/ha•yr	Lumped zero-order loss rate												√	

Program Variables, Documented Variables, Variable Description, and Program Screens Where Variables Can Be Changed (continued)

Program Variable	Variable	Units	Description	NCS	CS 1	2	3	4	5	6	7	8	9	10	11	12
LF	SLF	dimensionless	Slope/length factor (from Universal Soil Loss Equation)												√	
A	SMA	ha	Sludge management area												√	
RD	SRC	cm	Storm rainfall depth												√	
DELTAT	T11	yrs	Time elapsed since beginning of operation												√	
V	Q	m3/sec	Long-term receiving water flow rate												√	
THETA	VWC	dimensionless	Soil/sludge available water capacity												√	
TR	SDT	hrs	Storm rainfall duration												√	
P	PF	dimensionless	Supporting practice factor (from Universal Soil Loss Equation)												√	
CN	CN	none	SCS runoff curve number (from Universal Soil Loss Equation)												√	
C	CF	dimensionless	Cover management factor (from Universal Soil Loss Equation)												√	
KX	EF	tons/ft/ton-inch	Soil erodibility factor (from Universal Soil Loss Equation)												√	
BD	D	g/cm3	Soil/sludge bulk density												√	
RC		cm/yr	Recharge rate (SAME AS NET RECHARGE IN PATHWAY 12?)												√	
R		ft ton in/acre/year	Rainfall/runoff factor												√	
LB	BL	m	Buffer strip length												√	
SAS		none	Single/repeat application scenario (used in computer program only)												√	
CRIT	HCTWCi	mg/l	Maximum allowable concentration level in receiving water for contaminant i (Water Quality Criterion)												√	
NI	ISCi	mg/kg	Initial sludge concentration of contaminant i												√	
KD	KDi	cm3/g	Partition coefficient for the adsorption of contaminant i (concentration on solid phase divided by concentration in liquid phase at equilibrium)												√	
CS		mg/kg	Contaminant concentration (Initial guess of expected result)													√
SLMC	WS	kg/kg	Sludge moisture content at time of spreading													√
	UDX	m	UDX													√
IPHEH	pH		pH of each soil type													√
FOC		dimensionless	Fraction of organic carbon in the soil													√

Program Variables, Documented Variables, Variable Description, and Program Screens Where Variables Can Be Changed (continued)

Program Variable	Variable	Units	Description	NCS	CS 1	2	3	4	5	6	7	8	9	10	11	12
GBC		mg/l	Background concentration													√
APY	ΔT	Yrs	Application period													√
STWID	Y0	m	Application area width													√
STLEN	X0	m	Application area length													√
KOC			Carbon distribution coefficient for organics (concentration on solid phase divided by concentration in liquid phase at equilibrium)													√
EL	RC	mg/l	Effects level (such as MCL or maximum contaminant levels)													√
STRC	R	m/yr	Net recharge													√
IPHEH	Eh	eH	eH of each soil type													√
SLSC	S	kg/kg	Sludge storage capacity (1 - fraction solids)													√
STDB	ds	m	Distance from area boundary to monitoring location													√
EFBD	Bu	kg/m3	Effective bulk density for soil type													√
THTA	fs	m3/m3	Saturated moisture content for soil type													√
THICKi	m	m	Thickness of layer i													√
HC	K	m/day	Hydraulic conductivity of soil type													√

II. SYSTEM INSTALLATION AND PREPARATION

Your computer should be an IBM-compatible PC with a 1.2 mb high density drive and/or a hard disk.

A. Package Contents

Before you start, make sure that you have the following materials:

- o One High Density RAMMS diskette
- o Complete Documentation of the System/User Manual
- o Extra labels for working diskettes

You will also need to supply one high density 5 1/4 blank diskette.

B. Installation Procedures

1. Backup Procedures

Your computer and DOS (the Disk Operation System) must be running before you can install RAMMS. Follow these basic "backup" instructions prior to installing RAMMS:

a. Floppy-based System

1. Insert the DOS diskette into drive A and close the drive door.
2. Switch on your computer.
3. If the date and time need to be entered, do so at the appropriate prompt.

You should now be in DOS. When you see the DOS prompt (A> or B>) on your screen, you are in DOS.

4. Make a backup copy of the RAMMS diskette in the package (See your DOS manual for detail or consult a systems analyst).

Store the original diskette in a safe place for backup in case the copy is damaged.

b. Hard-disk System

1. Switch on your computer.
2. If the date and time need to be entered, do so at the appropriate prompt.

You should now be in DOS. When you see the DOS prompt (C>) on your screen, you are in DOS.

3. Make a backup copy of the RAMMS diskette in the package (See your DOS manual for detail or consult a systems analyst).

Store the original diskette in a safe place for backup in case the copy is damaged.

2. Installation Procedures

a. Install RAMMS into the hard disk.

1. With the C> prompt on your screen, insert the RAMMS diskette into drive A.
2. Enter **md\ramms** to make a new directory
3. Enter **cd\ramms** to change to the RAMMS directory.
4. Enter **copy a:*.*** to copy the RAMMS files from drive A to the C:RAMMS directory.

b. RAMMS also utilizes two files, "PRINT.COM" and "MORE.COM" from DOS 3.0. If your system has a different version of DOS, you need to copy these two files onto the RAMMS diskette.

C. Data Preparation

RAMMS routine requires a minimum of data preparation. A set of standard/default input values is used for execution of the system (i.e., no data input required). However, you can readily change any of the default values by observing the following set of guidelines:

- Group input data by type and contaminant
- Convert parameter measurements to their appropriate units
- Check input data for possible adjustments with the following format:
  - Number of contaminants--not more than 33
  - Contaminant name--not more than 6 characters
- Use the conventions below to qualify the parameter measurements:
  - "?" = missing
  - "NA" = not applicable.

The system will also accept custom files created by you. If the custom file format is inconsistent with the standard default file, the system may produce incorrect results or terminate execution.

III. SYSTEM USE INSTRUCTIONS

The RAMMS package is a menu-driven software system that calculates the maximum cumulative applications, the maximum single application, and the maximum annual application of a contaminant to protect specified plant, animals, or humans from toxic or carcinogenic effects from contaminants involved with sludge application. RAMMS encompasses 12 environmental pathway models which relate levels of toxic pollutants in sludges together with land application rates to the risk incurred by end-point receptors. The complete flowchart of the system is presented in Figure 3. This section provides an overview of the system and step-by-step procedures to system prompts and responses.

A. System Overview

As can be observed in the following paragraphs and the flowchart on the following page, the system begins with two introductory screens. The system then allows you to select a model by displaying available tiers and pathways. After you select the tier/pathway, the system displays default values for parameters that are shared with each pathway. Within each pathway selection, you may then select the standard default file or the custom sludge contaminant file. The file creation and data management section next allows you to edit, delete, add, or browse any or all of the records in the standard or custom file. At this point, you may also execute model computation. After any changes you make in the data, and then you go to model computation, the system allows you to save data changes temporarily or permanently in the current session. Results may be transmitted to any combination of the screen, printer, or disk. In addition, you can change direction at any point by stepping backward through the tree-structured screens by entering **[PgUp]**, **[PgDn]** or **[Esc]**, selecting another option/path, and proceeding again. You may exit from the system by entering **[Esc]** key repeatedly.

The following paragraphs describe the system prompts and illustrate responses. Screen-like figures include system prompts, and the numbers in square brackets provide the possible responses. The step-by-step procedures presented here are an example of only one tier model. The Agriculture tier 1, which uses all available pathways (1A, 1D, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12) was selected as the tier to present because it uses all pathways and allows you to view every parameter of this system.

B. Start of System

To start the RAMMS system, you should follow these basic instructions:

A. Floppy-based system:

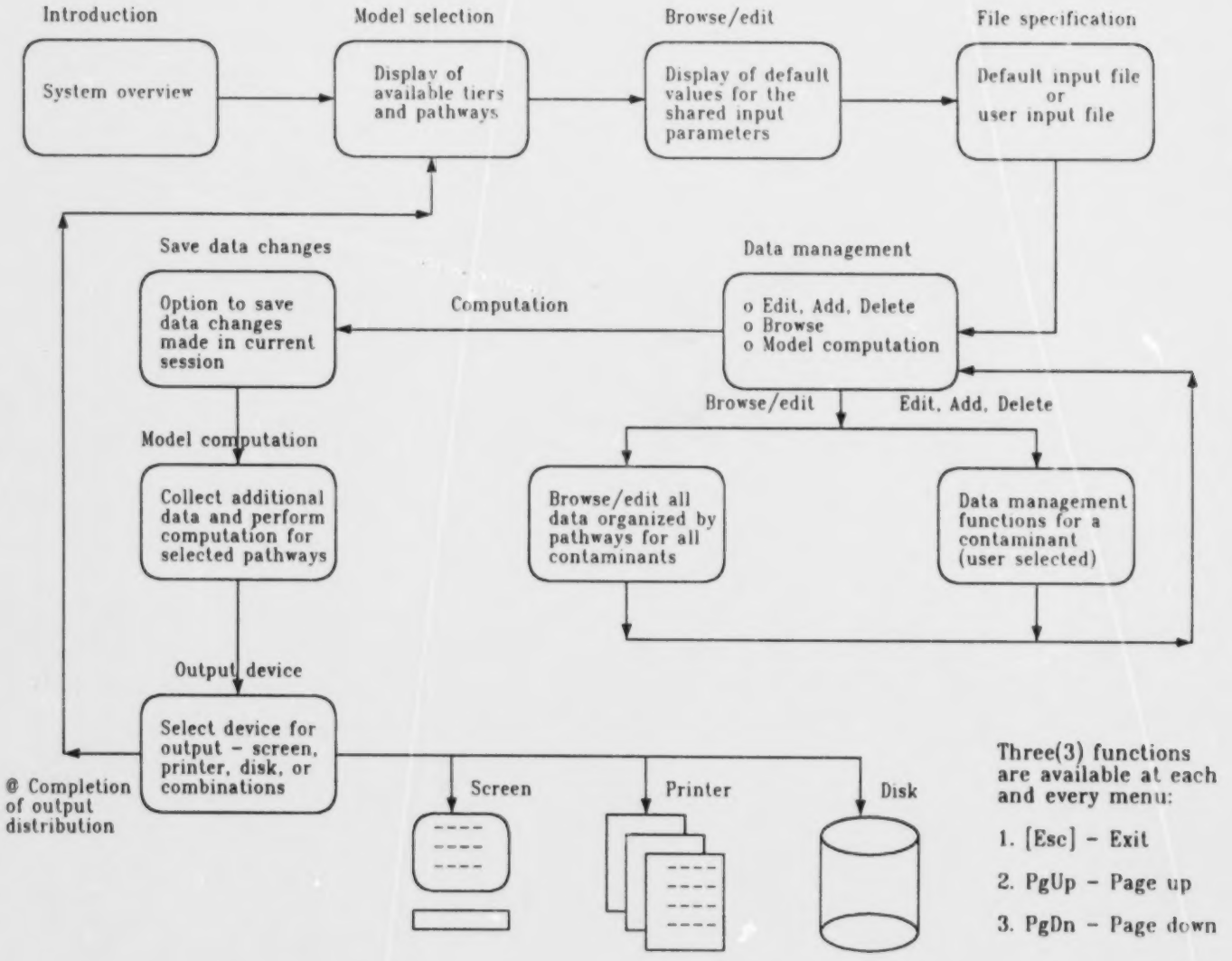
1. Insert the RAMMS diskette into drive A.
2. From the A> prompt, enter **RAMMS** to start the system.

B. Hard drive system:

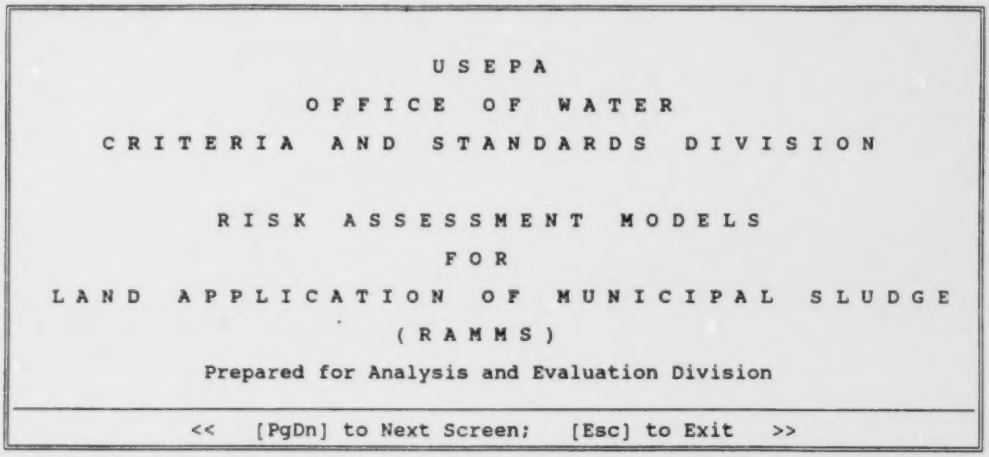
1. From the C> prompt, enter **cd\ramms** to change to the RAMMS directory.
2. Enter **RAMMS** to start the system.

AN OPERATIONS FLOW DIAGRAM FOR RAMMS

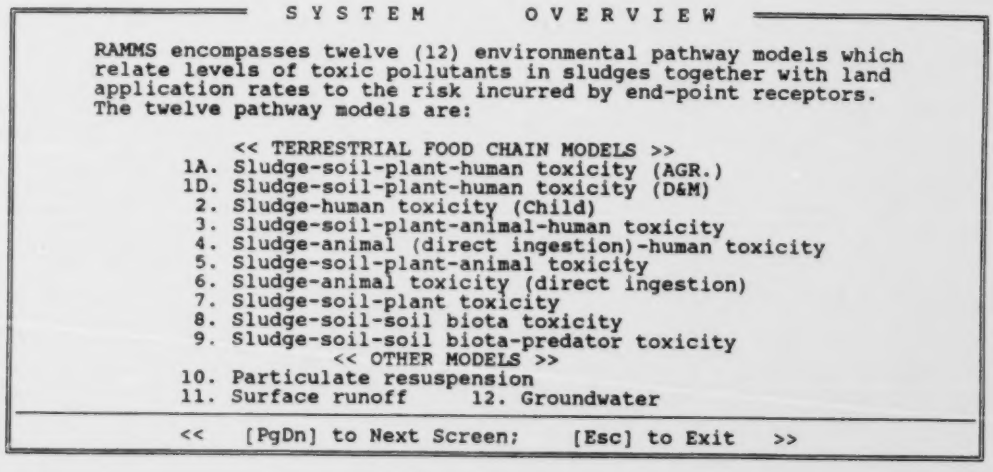
THE RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGES


Introduction
System overview
Model selection
Display of available tiers and pathways
Browse/edit
Display of default values for the shared input parameters
File specification
Default input file or user input file
Save data changes
Option to save data changes made in current session
Computation
Data management
o Edit, Add, Delete
o Browse
o Model computation
Browse/edit
Edit, Add, Delete
Model computation
Collect additional data and perform computation for selected pathways
Browse/edit all data organized by pathways for all contaminants
Data management functions for a contaminant (user selected)
Output device
Select device for output - screen, printer, disk, or combinations
@ Completion of output distribution
Screen
Printer
Disk
Three(3) functions are available at each and every menu:
1. [Esc] - Exit
2. PgUp - Page up
3. PgDn - Page down

The system starts with the following two information screens:



You can exit from the system by pressing **[Esc]** or proceed to the next screen by entering **[PgDn]**. If **[PgDn]** is selected, the system displays the following information screen:



Again, you can exit from the system by depressing **[Esc]**, return to the previous screen by depressing **[PgUp]**, or proceed to the next screen by entering **[PgDn]**. If **[PgDn]** is selected, the system displays the screen on the following page:

C. Data Management

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

SELECTION OF TIERS/MODELS

1. Agriculture
   (pathways 1A,1D,2,3,4,5,6,7,8,9,10,11,12)

2. Agriculture - Crops for Animal and Human Consumption
   (pathways 1A,1D,2,3,5,7,8,9,10,11,12)

3. Agriculture - Pasture and Future Residential Use
   (pathways 1D,2,4,6,7,8,9,10,11,12)

4. Distribution and Marketing (pathways 1D,2,7,8,9,11)

5. Customed Tier

6. Individual Pathway Selection

PLEASE ENTER DESIRED SELECTION OR HIT ESC TO MAIN MENU  1
<< [PgDn] or [PgUp] to Next or Previous Screen;  [ESC] to Exit >>
```

The above screen gives you the choice of selection of tiers or models for data management or model computation. For example, a selection of [1] will access the first agriculture tier (Pathways 1A, 1D, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12). The explanation of each of these pathways is presented in Section I. Introduction. The following screen will be displayed if you enter **[1] [PgDn]**. You can also exit from the system at any time by depressing **[Esc]**.

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

CONVERSION PERIOD FOR CORRESPONDING PATHWAYS

<<                    AGRICULTURE                    >>
```

PATHWAYS	1A	1D	2	3	4	5	6
CONVERSION PERIOD(YRS)	0.0822	5.0000	5.0000	0.0822	0.0822	0.0000	0.0000

PATHWAYS	7	8	9	10	11	12	
CONVERSION PERIOD(YRS)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	

```
<< Use Arrow Keys ↑ ↓ or ←┘ to Move Between Fields >>
<< [PgDn] or [PgUp] to Next or Previous Screen;  [ESC] to Exit >>
```

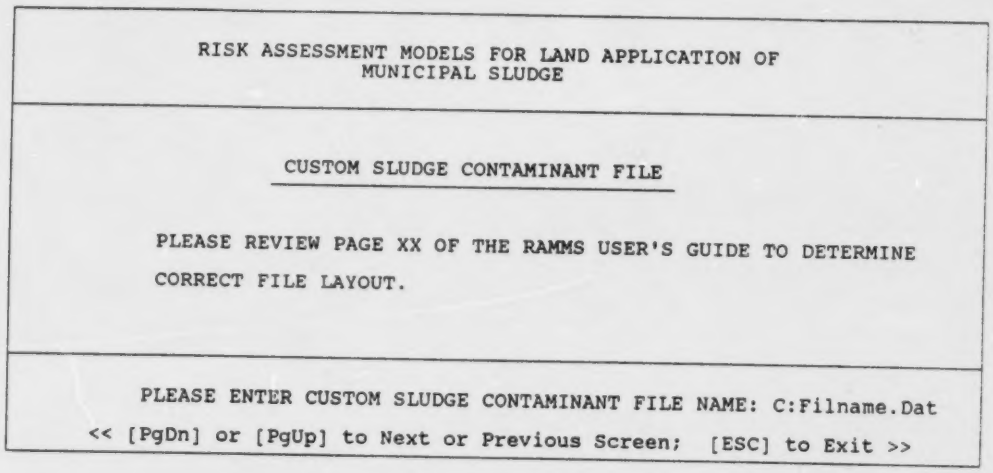
This screen presents Conversion Periods for all pathways. Conversion periods are described as waiting or land use conversion periods ("T" in years). This is to say that a waiting period after application of sludge may safely allow higher application rates of sludges that are due to chemical immobilization or degradation of constituents. Therefore, the need for a waiting period before planting crops will be evaluated, as well as a waiting period before grazing of treated pasture land. You can move about the screen at this time by using the arrow keys and change conversion periods for the corresponding pathways. You can also either proceed to the next screen by pressing **[PgDn]** or reverse to the previous screen by entering **[PgUp]**. The screen on the following page will be displayed if **[PgDn]** is selected:

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

          ****  COMMON INPUT PARAMATERS  ***
Annual sludge application rate      =      5000   (Kg DW/ha)
Upper depth of surface area         =        15   (cm)
Body weight (ADULT)                 =        70   (Kg)
Body weight (CHILD)                 =        10   (Kg)
Years of exposure                   =         5   (years)
Lifetime                            =        70   (years)
Sludge ingested per day             =       0.1   (g/day)
Soil ingested per day               =       0.1   (g/day)
Relative effectiveness              =       1.0
Risk level                          =    0.0001
Period of Gardening Use             =        20   (years)
      FRACTION  OF  DIETARY INTAKE  (SLUDGE)
Animal (EXPOSURE   < 30 DAYS)       =      0.08
Animal (EXPOSURE  >= 30 DAYS)       =      0.08
Human                               =      0.10

     << Use Arrow Keys ↑ ↓ or ←┘ to Move Between Fields >>
<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>
```

Common input parameters which are not contaminant-specific are presented in this field for review. Again, you may move about the fields by using the arrow keys or proceed to the next screen by entering **[PgDn]** or previous screen by entering **[PgUp]**. You can select a file specification in the next screen as presented below:

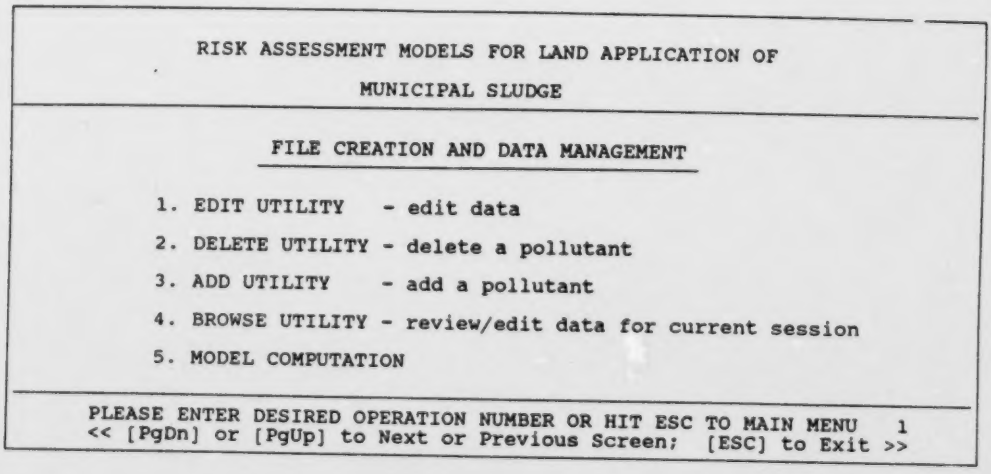
```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

          SPECIFY INPUT SLUDGE CONTAMINANT FILE


            1. Standard sludge contaminant file

            2. Custom sludge contaminant file

          .

   PLEASE ENTER DESIRED OPERATION NUMBER OR HIT ESC TO EXIT  1
<< [PgDn] or [PgUp] to Next or Previous Screen;  [ESC] to Exit >>
```

At this time, you must decide to select the standard/default file or customize a user-defined custom file. If **[1]** Standard File is the choice, the default standard file will be used. If **[2]** Custom File is the choice, the following screen will be displayed to prompt you for a file name:



A valid filename consists of a one-letter drive indicator, a filename of 1 to 8 characters, and a period followed by an extension of 1 to 3 characters. If the filename given does not exist, the system will terminate. In this case, you should start the system again and enter a correct filename. If [1] Standard File is the choice, the system will enter the file creation and data management operation loop as demonstrated in the following screen:

1. Edit Utility



Four types of data management functions are available as displayed on the screen above: [1] edit, [2] delete, [3] add, or [4] browse utilities. At this time, you can edit, delete, or add contaminant data. If the choice is to edit data [1], the system will display all the contaminants available from the selected file, as in the next screen on the following page:

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

LIST OF CONTAMINANTS

1. A/D	7. CU	13. HXBU	19. SE	25.	31.
2. AS	8. DDT	14. LIN	20. TCE	26.	32.
3. BAP	9. DNI	15. MO	21. TOX	27.	33.
4. CD	10. HEPC	16. NI	22. ZN	28.	
5. CLD	11. HG	17. PB	23.	29.	
6. CR	12. HXBE	18. PCB	24.	30.	

PLEASE ENTER DESIRED CONTAMINANT NUMBER OR HIT ESC TO EXIT 17
<< [PgUp] to Previous Screen >>

1. A/D = Aldrin/Dieldrin
2. AS = Arsenic
3. BAP = Benzo[a]pyrene
4. CD = Cadmium
5. CLD = Chlordane
6. CR = Chromium
7. CU = Copper
8. DDT = DDT
9. DNI = Dimethyl nitrosamine
10. HEPC = Heptachlor
11. HG = Mercury
12. HXBE = Hexachlorobenzene
13. HXBU = Hexachlorobutadiene
14. LIN = Lindane
15. MO = Molybdenum
16. NI = Nickel
17. PB = Lead
18. PCB = PCBs
19. SE = Selenium
20. TCE = Trichloroethylene
21. TOX = Toxaphene
22. ZN = Zinc

At this time, you ean select a contaminant for editing all data management functions for each pathway in this tier (which is every pathway available in the system). After you select a contaminant for editing by entering the corresponding number (i.e., "17 for "PB or lead") by depressing **[corresponding number] [PgDn]**, the system will search for all relevant input parameters concerning the selected contaminant and display the information in the next fourteen screens (organized by pathway) for possible modification. You can move freely through the files by using the arrow keys and by depressing **[PgUp]** or **[PgDn]** to move forwards or backwards through the pathways, respectively.

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAYS 1 THROUGH 12 ****

POLLUTANT NAME: PB

Background soil concentration prior to any sludge application	= 11	(mg/day)
Carcinogen/Noncarcinogen indicator (C/N)	= N	
Overall pseudo first order rate constant for the removal of pollutant	=	(per year)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAYS 1 THROUGH 4 ****

POLLUTANT NAME: PB

Acceptable daily intake of pollutant = .002 (mg/kg/day)

Human cancer potency = 1/(mg/kg/day)

Daily background intake of pollutant = 0 (adult) 0 (child) (mg/day)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAYS 1A AND 1D ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? Y

Slope of uptake curve for vegetable (ug/g dry wt plant)/(kg/ha)

	POTATOES	LEAFY VEG.	F. LEGUME	D. LEGUME	ROOT VEG.	GARDEN FRUIT	CORN/ GRAIN	PEANUTS
AGR.	0.0008	0.0060	0.0010	0.0010	0.0030	0.0020	0.0100	0.0010
D&M	0.0008	0.0080	0.0010	0.0010	0.0030	0.0020	0.0100	

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** PATHWAY 2 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? Y

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAY 3 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? N

Mean slope of uptake curve for plant =

Mean slope of uptake curve for animal tissue
(ug/g dry wt tissue or product)/(ug/g dry wt feed)

	BEEF	BEEF LIVER	POULTRY	PORK	LAMB	DAIRY	EGGS
=							

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAY 4 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? N

Mean slope of uptake curve for animal tissue
(ug/g dry wt tissue or product)/(ug/g dry wt feed)

	BEEF	BEEF LIVER	POULTRY	PORK	LAMB	DAIRY	EGGS
=							

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAY 5 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? N

Background plant concentration of organic pollutant = (ug/g)

Mean slope of uptake curve for plant = 0

Herbivore toxic threshold feed concentration of pollutant = (ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAY 6 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? N

Background concentration of pollutant in corp = (ug/g)

Herbivore toxic threshold feed concentration of pollutant = (ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAY 7 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ?

Phytotoxic threshold soil concentration of inorganic or organic pollutant = (ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAY 8 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? N

Soil biota toxic threshold soil concentration of inorganic or organic pollutant = (ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAY 9 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? Y

Background soil biota concentration of pollutant	=	18.9	(ug/g)
Mean slope of uptake curve for soil	=	0.33	
Predator toxic threshold feed concentration of pollutant for SC	=	39.6	(ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAY 10 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? Y

Inhalable particulate air concentration as given by INPUFF	=	.02	(g/m3)
Reference inhalable air concentration	=	0.050	(mg/m3)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (EDIT)

**** INPUT PARAMETERS FOR PATHWAY 11 ****

POLLUTANT NAME: PB

Do you wish to include this pollutant for this pathway (Y/N) ? Y

Maximum allowable concentration level	=	0.032	(mg/l)
Partition coefficient for the absorption of pollutant	=	597	(cm3/g)
Initial sludge concentration	=	927	(mg/kg)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE                                          ( EDIT )

          ****  INPUT PARAMETERS FOR PATHWAY 12  ****

                POLLUTANT NAME:  PB

Do you wish to include this pollutant for this pathway (Y/N) ?    Y

  Concentration                                  =  18190.    (mg/kg)
  Effects level                                  =  0.05      (mg/l)
  Background concentration                       =  0.001     (mg/l)
  Carbon distribution coefficient for organics   =  0

<< [PgDn] or [PgUp] to Next or Previous Screen;  [ESC] to Exit >>
```

After you have modified (edited) any contaminant parameters, you can return to the file utility function by depressing **[PgDn]**. As the following screen presents, other functions, such as editing other contaminants, or adding and deleting contaminants may be selected:

2. Delete Utility

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

FILE CREATION AND DATA MANAGEMENT

1. EDIT UTILITY   - edit data
2. DELETE UTILITY - delete a pollutant
3. ADD UTILITY    - add a pollutant
4. BROWSE UTILITY - review/edit data for current session
5. MODEL COMPUTATION

PLEASE ENTER DESIRED OPERATION NUMBER OR HIT ESC TO MAIN MENU   2
<< [PgDn] or [PgUp] to Next or Previous Screen;  [ESC] to Exit >>
```

The second utility available is the delete function. If you would like to delete any contaminant from all pathways, you may do so with this function. By entering **[2] [PgDn]**, the system will prompt you to identify the contaminant to be deleted as in the following screen:

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

LIST OF CONTAMINANTS

1. A/D	7. CU	13. HXBU	19. SE	25.	31.
2. AS	8. DDT	14. LIN	20. TCE	26.	32.
3. BAP	9. DNI	15. MO	21. TOX	27.	33.
4. CD	10. HEPC	16. NI	22. ZN	28.	
5. CLD	11. HG	17. PB	23.	29.	
6. CR	12. HXBE	18. PCB	24.	30.	

PLEASE ENTER DESIRED CONTAMINANT NUMBER OR HIT ESC TO EXIT 17
<< [PgUp] to Previous Screen >>

You can identify the contaminant (i.e. "17" for "PB or lead") by entering **[the number of the contaminant] [PgDn]** and the system will prompt you to confirm or escape the deletion with a [Y] or [N] when prompted by the message, "ARE YOU SURE (Y/N)?" as in the next screen:

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

LIST OF CONTAMINANTS

1. A/D	7. CU	13. HXBU	19. SE	25.	31.
2. AS	8. DDT	14. LIN	20. TCE	26.	32.
3. BAP	9. DNI	15. MO	21. TOX	27.	33.
4. CD	10. HEPC	16. NI	22. ZN	28.	
5. CLD	11. HG	17. PB	23.	29.	
6. CR	12. HXBE	18. PCB	24.	30.	

PLEASE ENTER DESIRED CONTAMINANT NUMBER OR HIT ESC TO EXIT 17
A R E Y O U S U R E (Y/N)?

If [Y] (yes) is answered, the record will be marked for deletion. If [N] (no) is entered, the system will not delete the contaminant and will return to the File Creation and Data Management screen as presented in the next screen:

3. Add Utility

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

FILE CREATION AND DATA MANAGEMENT

1. EDIT UTILITY    - edit data
2. DELETE UTILITY  - delete a pollutant
3. ADD UTILITY     - add a pollutant
4. BROWSE UTILITY  - review/edit data for current session
5. MODEL COMPUTATION

PLEASE ENTER DESIRED OPERATION NUMBER OR HIT ESC TO MAIN MENU   3
<< [PgDn] or [PgUp] to Next or Previous Screen;  [ESC] to Exit >>
```

If you would like to add contaminants to the file, you may do this with the add function. By selecting **[3] [PgDn]**, the system will display the next fourteen screens to collect all the contaminant specific data for each pathway available in the tier (in this case, again, all parameters are presented). You may move freely from field to field and screen to screen and enter available/appropriate data. Again, use the arrow keys, **[PgUp]**, **[PgDn]**, and **[Esc]** to move about the fields, backward, forward, and exit from the system, respectively.

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE                                        ( ADD )

****  INPUT PARAMETERS FOR PATHWAYS 1 THROUGH 12  ****

POLLUTANT NAME:

Background soil concentration
prior to any sludge application              =          (mg/day)

Carcinogen/Noncarcinogen indicator (C/N)     =

Overall pseudo first order rate constant
for the removal of pollutant                 =          (per year)

<< [PgDn] or [PgUp] to Next or Previous Screen;  [ESC] to Exit >>
```

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAYS 1 THROUGH 4 ****

POLLUTANT NAME:

Acceptable daily intake of pollutant = (mg/kg/day)

Human cancer potency = 1/(mg/kg/day)

Daily background intake of pollutant = (mg/day)
(adult) (child)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAYS 1A AND 1D ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Slope of uptake curve for vegetable (ug/g dry wt plant)/(kg/ha)

	POTATOES	LEAFY VEG.	F. LEGUME	D. LEGUME	ROOT VEG.	GARDEN FRUIT	CORN/ GRAIN	PEANUTS
AGR. D&M								

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** PATHWAY 2 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAY 3 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Mean slope of uptake curve for plant =

Mean slope of uptake curve for animal tissue
(ug/g dry wt tissue or product)/(ug/g dry wt feed)

	BEEF	BEEF LIVER	POULTRY	PORK	LAMB	DAIRY	EGGS
=							

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAY 4 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Mean slope of uptake curve for animal tissue
(ug/g dry wt tissue or product)/(ug/g dry wt feed)

	BEEF	BEEF LIVER	POULTRY	PORK	LAMB	DAIRY	EGGS
=							

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAY 5 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Background plant concentration of organic pollutant = (ug/g)

Mean slope of uptake curve for plant =

Herbivore toxic threshold feed concentration of pollutant = (ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAY 6 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Background concentration of pollutant in corp = (ug/g)

Herbivore toxic threshold feed concentration of pollutant = (ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAY 7 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Phytotoxic threshold soil concentration of inorganic or organic pollutant = (ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAY 8 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Soil biota toxic threshold soil concentration of inorganic or organic pollutant = (ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAY 9 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Background soil biota concentration of pollutant	=	(ug/g)
Mean slope of uptake curve for soil	=	
Predator toxic threshold feed concentration of pollutant for SC	=	(ug/g)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAY 10 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Inhalable particulate air concentration as given by INPUFF	=	(g/m3)
Reference inhalable air concentration	=	(mg/m3)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE (ADD)

**** INPUT PARAMETERS FOR PATHWAY 11 ****

POLLUTANT NAME:

Do you wish to include this pollutant for this pathway (Y/N) ?

Maximum allowable concentration level	=	(mg/l)
Partition coefficient for the absorption of pollutant	=	(cm3/g)
Initial sludge concentration	=	(mg/kg)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE                                          ( ADD )

        ****  INPUT PARAMETERS FOR PATHWAY 12  ****

                POLLUTANT NAME:

  Do you wish to include this pollutant for this pathway (Y/N) ?

  Concentration                                  =          (mg/kg)
  Effects level                                  =          (mg/l)
  Background concentration                       =          (mg/l)
  Carbon distribution coefficient for organics   =

  << [PgDn] or [PgUp] to Next or Previous Screen;  [ESC] to Exit >>
```

After adding contaminant data for each pathway, you may return to the File Creation and Data Management Selection screen by entering **[PgDn]**. At this time you may select another contaminant to add, edit or delete, or you may browse all data organized by the pathways available in the tier for all contaminants.

4. Browse Utility

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

FILE CREATION AND DATA MANAGEMENT

  1. EDIT UTILITY    - edit data
  2. DELETE UTILITY  - delete a pollutant
  3. ADD UTILITY     - add a pollutant
  4. BROWSE UTILITY  - review/edit data for current session
  5. MODEL COMPUTATION

PLEASE ENTER DESIRED OPERATION NUMBER OR HIT ESC TO MAIN MENU   4
<< [PgDn] or [PgUp] to Next or Previous Screen;  [ESC] to Exit >>
```

If you wish to browse or edit all the data by pathways for all contaminants instead of by individual contaminant, you can select **[4] [PgDn]** at this time. You can move forward (**[PgDn]**) or backwards (**[PgUp]**) through the following 28 screens (two for each pathway option) to review the data, move from field to field within each screen by using the arrow keys to edit the data, or exit (**[Esc]**) from the system.

(PATHWAYS 1 - 12) << R A M M S >> (BROWSE)

POLLUTANT	BACKGROUND SOIL CONCENTRATION PRIOR TO ANY SLUDGE APPLICATION (mg/day)	CARCINOGEN OR NONCARCINOGEN INDICATOR (C/N)	OVERALL PSEUDO FIRST ORDER RATE CONSTANT FOR THE REMOVAL OF POLLUTANT (per year)
A/D	0	C	.692
AS	3	N	
BAP	0	C	3.65
CD	.2	N	
CLD	0	C	0.583
CR	100	N	
CU	19	N	
DDT	0	C	0
DNI		C	5.11
HEPC	0	C	.692
HG	0.1	N	

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAYS 1 - 12) << R A M M S >> (BROWSE)

POLLUTANT	BACKGROUND SOIL CONCENTRATION PRIOR TO ANY SLUDGE APPLICATION (mg/day)	CARCINOGEN OR NONCARCINOGEN INDICATOR (C/N)	OVERALL PSEUDO FIRST ORDER RATE CONSTANT FOR THE REMOVAL OF POLLUTANT (per year)
HXBE	0	C	0.165
HXBU	0	C	0
LIN	0	C	0.657
MO	2	N	
NI	18	N	
PB	11	N	
PCB	0	C	0.116
SE	0.21	N	
TCE	0	C	0
TOX	0	C	0.063
ZN	54	N	

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAYS 1 - 4) << R A M M S >> (BROWSE)

POLLUTANT	ACCEPTABLE DAILY INTAKE OF POLLUTANT (mg/kg/day)	HUMAN CANCER POTENCY 1 / (mg/kg/day)	DAILY BACKGROUND INTAKE OF POLLUTANT (mg/day)	
			adult	child
A/D		17	0	0
AS	0.0014		.057	0.013
BAP		11.5	0	0
CD	0.001		0.033	0.013
CLD		1.3	0	0
CR				
CU				
DDT		0.34	0	0
DNI				
HEPC		9.1	0	0
HG	0.0003		0.006	0.001

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAYS 1 - 4) << R A M M S >> (BROWSE)

POLLUTANT	ACCEPTABLE DAILY INTAKE OF POLLUTANT (mg/kg/day)	HUMAN CANCER POTENCY 1 / (mg/kg/day)	DAILY BACKGROUND INTAKE OF POLLUTANT (mg/day)	
			adult	child
HXBE		1.67	0	0
HXBU		0.0775	0	0
LIN		1.33	0	0
MO				
NI	0.02		0.4	0.135
PB	.002		0	0
PCB		7.7	0	0
SE	0.0045		0.141	0.052
TCE		0.011	0	0
TOX		1.13	0	0
ZN	0.47		18	7.8

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 1A) << R A M M S >> (BROWSE)

POLLUTANT	SLOPE OF UPTAKE CURVE FOR VEGETABLE (ug/g dry wt plant) / (kg/ha) AGRICULTURE							
	potatoes	leafy veg.	f. legume	d. legume	root veg.	garden fruit	corn/ grain	peanuts
A/D	0.1300	0.2000	0.8100	0.8100	0.4300	0.2200	0.0300	0.8100
AS	0.0006	0.0400	0.0002	0.0002	0.0200	0.0020	0.0004	0.0002
BAP	0.4200	0.2900	0.4200	0.4200	0.6100	0.4200	0.4200	0.4200
CD	0.0300	0.3800	0.0100	0.0100	0.2200	0.0500	0.0160	0.0100
CLD								
CR								
CU								
DDT	0.0700	0.1100	0.0400	0.0400	0.1100	0.1100	0.4800	0.0400
DNI								
HEPC	0.3000	0.0200	0.0400	0.0400	2.7100	0.2100	0.1400	0.0400
HG	0.0033	0.0071	0.0010	0.0010	0.0170	0.0033	0.0010	0.0010

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 1A) << R A M M S >> (BROWSE)

POLLUTANT	SLOPE OF UPTAKE CURVE FOR VEGETABLE (ug/g dry wt plant) / (kg/ha) AGRICULTURE							
	potatoes	leafy veg.	f. legume	d. legume	root veg.	garden fruit	corn/ grain	peanuts
HXBE	0.7500	0.5600	0.7800	0.7800	1.1100	0.7800	0.7800	0.7800
HXBU								
LIN								
MO								
NI	0.0440	0.0900	0.0400	0.0400	0.0300	0.0300	0.0400	0.0400
PB	0.0008	0.0060	0.0010	0.0010	0.0030	0.0020	0.0100	0.0010
PCB	0.0008	0.3800	0.0020	0.0020	0.3600	0.0200	0.0000	0.0010
SE	0.0200	0.0700	0.0200	0.0200	0.0400	0.0400	0.0300	0.0200
TCE								
TOX	0.2700	0.0700	0.0700	0.0700	1.7300	0.0700	0.0700	0.0700
ZN	0.0600	0.2700	0.0500	0.0500	0.0500	0.0400	0.0300	0.0500

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 1D) << R A M M S >> (BROWSE)

SLOPE OF UPTAKE CURVE FOR VEGETABLE
(ug/g dry wt plant) / (kg/ha)
DISTRIBUTION AND MARKETING

POLLUTANT	potatoes	leafy veg.	f. legume	d. legume	root veg.	garden fruit	corn/ grain
A/D	0.1300	0.2000	0.8100	0.8100	0.4300	0.2200	0.0200
AS	0.0006	0.0400	0.0002	0.0002	0.0200	0.0020	0.0001
BAP	0.4200	0.2900	0.4200	0.4200	0.6100	0.4200	0.4200
CD	0.0300	0.4300	0.0100	0.0100	0.2200	0.0500	0.0300
CLD							
CR							
CU							
DDT	0.0700	0.1100	0.0400	0.0400	0.1100	0.1100	0.5100
DNI							
HEPC	0.3000	0.0200	0.0400	0.0400	2.7100	0.2100	0.1400
HG	0.0033	0.0070	0.0010	0.0010	0.0170	0.0033	0.0033

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 1D) << R A M M S >> (BROWSE)

SLOPE OF UPTAKE CURVE FOR VEGETABLE
(ug/g dry wt plant) / (kg/ha)
DISTRIBUTION AND MARKETING

POLLUTANT	potatoes	leafy veg.	f. legume	d. legume	root veg.	garden fruit	corn/ grain
HXBE	0.7500	0.5600	0.7800	0.7800	1.1100	0.7800	0.7800
HXBU							
LIN							
MO							
NI	0.1250	0.0900	0.1300	0.1300	0.5200	0.0400	0.1300
PB	0.0008	0.0080	0.0010	0.0010	0.0030	0.0020	0.0100
PCB	0.0200	0.3800	0.0020	0.0020	0.3600	0.0200	0.0000
SE	0.0200	0.0700	0.0200	0.0200	0.0400	0.0400	0.0300
TCE							
TOX	0.2700	0.0700	0.0700	0.0700	1.7300	0.0700	0.0700
ZN	0.0200	0.8000	0.0400	0.0400	0.0500	0.0400	0.0400

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 3) << R A M M S >> (BROWSE)

MEAN SLOPE OF UPTAKE CURVE FOR ANIMAL TISSUE
(ug/g dry tissue or product) / (ug/g dry wt feed)

POLLUTANT	MEAN SLOPE OF UPTAKE CURVE FOR PLANT	beef	beef liver	poultry	pork	lamb	dairy	eggs
A/D	0.02	2.670	0.140	44.070	1.170	2.240	5.540	11.950
AS								
BAP								
CD	0.10	.0005	0.0022	0.0024	0.0015	0.0000	.00043	0.0008
CLD	0.63	0.040	0.040	0.040	0.040	0.040	0.220	0.040
CR								
CU								
DDT	0.61	4.570	4.570	5.000	3.770	3.110	3.770	5.000
DNI								
HEPC	0.036	4.940	4.940	3.550	4.190	4.190	4.270	3.550
HG	0.04	0.002	0.020	2.330	0.019	0.0014	0.007	2.880

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 3) << R A M M S >> (BROWSE)

POLLUTANT	MEAN SLOPE OF UPTAKE CURVE FOR PLANT	MEAN SLOPE OF UPTAKE CURVE FOR ANIMAL TISSUE (ug/g dry tissue or product) / (ug/g dry wt feed)						
		beef	beef liver	poultry	pork	lamb	dairy	eggs
HXBE	0.25	3.000	3.000	5.900	4.600	7.000	3.200	3.30
HXBU								
LIN								
MO								
NI								
PB								
PCB	0.25	4.000	4.000	4.000	4.000	4.000	4.800	4.000
SE	.09	0.550	0.420	0.550	0.280	0.550	0.550	0.550
TCE								
TOX	.88	0.850	0.850	0.790	0.790	0.740	0.020	0.790
ZN	.97	0	0	0.020	0	1.100	0	0.020

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 4) << R A M M S >> (BROWSE)

POLLUTANT	MEAN SLOPE OF UPTAKE CURVE FOR ANIMAL TISSUE (ug/g dry wt tissue or product) / (ug/g dry wt feed)						
	beef	beef liver	poultry	pork	lamb	dairy	eggs
A/D	2.670	0.140	44.070	1.170	2.240	5.540	11.950
AS							
BAP							
CD	.0005	0.0022	0.0024	0.0015	0.0000	.00043	0.0008
CLD	0.040	0.040	0.040	0.040	0.040	0.220	0.040
CR							
CU							
DDT	4.570	4.570	5.000	3.770	3.110	3.770	5.000
DNI							
HEPC	4.940	4.940	3.550	4.190	4.190	4.270	3.550
HG	0.002	0.020	2.330	0.019	.0014	0.007	2.880

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 4) << R A M M S >> (BROWSE)

POLLUTANT	MEAN SLOPE OF UPTAKE CURVE FOR ANIMAL TISSUE (ug/g dry wt tissue or product) / (ug/g dry wt feed)						
	beef	beef liver	poultry	pork	lamb	dairy	eggs
HXBE	3.000	3.000	5.900	4.600	7.000	3.200	3.300
HXBU	2.480	2.480	2.480	2.480	2.480	2.480	2.480
LIN	0.480	0.480	0.600	0.600	0.480	0.480	0.600
MO							
NI							
PB							
PCB	4.000	4.000	4.000	4.000	4.000	4.800	4.000
SE							
TCE							
TOX	0.850	0.850	0.790	0.790	0.740	0.020	0.790
ZN							

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 5) << R A M M S >> (BROWSE)

POLLUTANT	BACKGROUND PLANT CONCENTRATION OF ORGANIC POLLUTANT (ug/g)	MEAN SLOPE OF UPTAKE CURVE FOR PLANT	HERBIVORE TOXIC THRESHOLD FEED CONCENTRATION OF POLLUTANT (ug/g)
A/D		0	
AS		0	
BAP		0	
CD	0.09	0.10	5
CLD		0	
CR		0	
CU	2.1	0.15	25
DDT		0	
DNI		0	
HEPC		0	
HG		0	

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 5) << R A M M S >> (BROWSE)

POLLUTANT	BACKGROUND PLANT CONCENTRATION OF ORGANIC POLLUTANT (ug/g)	MEAN SLOPE OF UPTAKE CURVE FOR PLANT	HERBIVORE TOXIC THRESHOLD FEED CONCENTRATION OF POLLUTANT (ug/g)
HXBE		0	
HXBU		0	
LIN		0	
MO	1.1	0.769	5
NI		0	
PB		0	
PCB		0	
SE	0.03	0.07	2.30
TCE		0	
TOX		0	
ZN	26.0	0.058	300.00

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 6) << R A M M S >> (BROWSE)

POLLUTANT	BACKGROUND CONCENTRATION OF POLLUTANT IN CORP (ug/g)	HERBIVORE TOXIC THRESHOLD FEED CONCENTRATION OF POLLUTANT (ug/g)
A/D		
AS		
BAP		
CD		
CLD		
CR		
CU	2.1	25
DDT		
DNI		
HEPC		
HG		

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 6) << R A M M S >> (BROWSE)

POLLUTANT	BACKGROUND CONCENTRATION OF POLLUTANT IN CORP (ug/g)	HERBIVORE TOXIC THRESHOLD FEED CONCENTRATION OF POLLUTANT (ug/g)
HXBE		
HXBU		
LIN		
MO		
NI		
PB		
PCB		
SE		
TCE		
TOX		
ZN		

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 7) << R A M M S >> (BROWSE)

POLLUTANT	PHYTOTOXIC THRESHOLD SOIL CONCENTRATION OF INORGANIC OR ORGANIC POLLUTANT (ug/g)
A/D	
AS	
BAP	
CD	89.4
CLD	
CR	365
CU	42
DDT	
DNI	
HEPC	
HG	

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 7) << R A M M S >> (BROWSE)

POLLUTANT	PHYTOTOXIC THRESHOLD SOIL CONCENTRATION OF INORGANIC OR ORGANIC POLLUTANT (ug/g)
HXBE	
HXBU	
LIN	
MO	
NI	57
PB	
PCB	
SE	
TCE	
TOX	
ZN	140

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 8) << R A M M S >> (BROWSE)

POLLUTANT	SOIL BIOTA TOXIC THRESHOLD SOIL CONCENTRATION OF INORGANIC OR ORGANIC POLLUTANT (ug/g)
A/D	
AS	
BAP	
CD	
CLD	
CR	131
CU	
DDT	
DNI	
HEPC	
HG	

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 8) << R A M M S >> (BROWSE)

POLLUTANT	SOIL BIOTA TOXIC THRESHOLD SOIL CONCENTRATION OF INORGANIC OR ORGANIC POLLUTANT (ug/g)
HXBE	
HXBU	
LIN	
MO	
NI	
PB	
PCB	
SE	
TCE	
TOX	
ZN	

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 9) << R A M M S >> (BROWSE)

POLLUTANT	BACKGROUND SOIL BIOTA CONCENTRATION OF POLLUTANT (ug/g)	MEAN SLOPE OF UPTAKE CURVE FOR SOIL	PREDATOR TOXIC THRESHOLD FEED CONCENTRATION OF POLLUTANT FOR SC (ug/g)
HXBE	.59	67.7	1.7
HXBU			
LIN			
MO	4.8	2.3	6
NI			
PB			
PCB			
SE			
TCE			
TOX			
ZN			

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 9) << R A M M S >> (BROWSE)

POLLUTANT	BACKGROUND SOIL BIOTA CONCENTRATION OF POLLUTANT (ug/g)	MEAN SLOPE OF UPTAKE CURVE FOR SOIL	PREDATOR TOXIC THRESHOLD FEED CONCENTRATION OF POLLUTANT FOR SC (ug/g)
HXBE			
HXBU			
LIN			
MO			
NI			
PB	18.9	0.33	39.6
PCB			
SE			
TCE			
TOX			
ZN	228	2.95	894

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 10) << R A M M S >> (BROWSE)

POLLUTANT	INHALABLE PARTICULATE AIR CONCENTRATION AS GIVEN BY INPUFF (g/m3)	REFERENCE INHALABLE AIR CONCENTRATION (mg/m3)
A/D	0	0.150
AS	0.0014	0.002
BAP	0	0
CD	0.002	0.040
CLD	0	0
CR		0.025
CU		0
DDT	0	0.500
DNI		
HEPC	0	0
HG	0.0003	0.050

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 10) << R A M M S >> (BROWSE)

POLLUTANT	INHALABLE PARTICULATE AIR CONCENTRATION AS GIVEN BY INPUFF (g/m3)	REFERENCE INHALABLE AIR CONCENTRATION (mg/m3)
HXBE	0	0
HXBU	0	0
LIN	0	0
MO	NA	0
NI	0.02	0.015
PB	.02	0.050
PCB	0	0.001
SE	0.0045	0
TCE	0	0
TOX	0	0
ZN	0.47	0

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 11) << R A M M S >> (BROWSE)

POLLUTANT	MAXIMUM ALLOWABLE CONCENTRATION LEVEL (mg/l)	PARTITION COEFFICIENT FOR THE ABSORPTION OF POLLUTANT (cm3/g)	INITIAL SLUDGE CONCENTRATION (mg/kg)
A/D	0.0000071	23	0.0882
AS	0.00022	19.4	19.8
BAP	0.00028	27500	0.505
CD	0.0011	423	84.1
CLD	0.0000043	850	0.0888
CR	0.011	56.5	1190
CU	0.012	92.2	1224
DDT	0.00000I	25000	0.249
DNI	0.00014	.0002	0.87
HEPC	0.0000038	46	0.0888
HG	0.0001	580	6.27

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 11) << R A M M S >> (BROWSE)

POLLUTANT	MAXIMUM ALLOWABLE CONCENTRATION LEVEL (mg/l)	PARTITION COEFFICIENT FOR THE ABSORPTION OF POLLUTANT (cm3/g)	INITIAL SLUDGE CONCENTRATION (mg/kg)
HXBE	0.000072	20	0.699
HXBU	0.0093	38	0.03
LIN	0.00008	5.4	0.0888
MO	0	43.4	35.6
NI	0.0134	58.6	365
PB	0.032	597	927
PCB	0.0000079	1600	0.0888
SE	0.0276	14.9	8.52
TCE	0.27	0.99	14.0
TOX	0.0000002	4.80	0.0888
ZN	0.11	939	4199

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 12) << R A M M S >> (BROWSE)

POLLUTANT	CONCENTRATION (mg/kg)	EFFECTS LEVEL (mg/l)	BACKGROUND CONCENTRATION (mg/l)	CARBON DISTRIBUTION COEFFICIENT FOR ORGANICS
A/D			0	0
AS	753.5	0.05	0.0004	0
BAP	26.8	0.0003	0	5500000
CD	1330.0	0.01	0.001	0
CLD	240.3	0.00269	0	170000
CR	100000.	0.05	0.0014	0
CU	100000.	1.3	0.01	0
DDT	911.3	0.0102	0	5000000
DNI	8.934	0.0001	0	0.04
HEPC			0	0
HG	345.1	0.002	0.0003	0

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 12) << R A M M S >> (BROWSE)

POLLUTANT	CONCENTRATION (mg/kg)	EFFECTS LEVEL (mg/l)	BACKGROUND CONCENTRATION (mg/l)	CARBON DISTRIBUTION COEFFICIENT FOR ORGANICS
HXBE			0	0
HXBU			0	0
LIN	100000.	0.004	0	1080.
MO			0	0
NI	35940.	1.75	0.0027	0
PB	18190.	0.05	0.001	0
PCB	40.56	0.00045	0	320000
SE			0	0
TCE	4.97	0.005	0	198
TOX	553.5	0.005	0	960
ZN	100000.	16.45	0.02	0

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

After reviewing the data and editing as appropriate in browse, you may select **[PgDn]** at this time and, the system will return to the File Creation and Data Management operation as in the following screen:

RISK ASSESSMENT MODELS FOR LAND APPLICATION OF MUNICIPAL SLUDGE

FILE CREATION AND DATA MANAGEMENT

1. EDIT UTILITY - edit data
2. DELETE UTILITY - delete a pollutant
3. ADD UTILITY - add a pollutant
4. BROWSE UTILITY - review/edit data for current session
5. MODEL COMPUTATION

PLEASE ENTER DESIRED OPERATION NUMBER OR HIT ESC TO MAIN MENU 5
<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

Would you like to save your modifications permanently (Y/N)?

D. Model Computation

If you have edited, added, and deleted all contaminants you wish to, you can continue to model computation by entering [5]. At this point, the system will ask you if you would like to save the modifications made in [1] edit, [2] delete, [3] add ,or [4] browse utilities in this session permanently or temporarily by answering [Y] or [N], respectively, as observed in the screen above. If the response is [Y] (yes), the system will ask you for a file name. A valid filename consists of a one-letter drive indicator, a filename of 1 to 8 characters, and a period followed by an extension of 1 to 3 characters. If [N] (no) is the response, the system will use the modifications on in this sessions model computation only and does not place them in a file. The system will proceed to display the input or default parameter values as in the next three screens. You may move about the fields or screens and change any data you seem appropriate for your application.

(PATHWAYS 1A & 1D) << R A M M S >>

****** DAILY INTAKE OF VEGETABLE ******

	POTATO	LEAFY VEG.	F. LEGUME	D. LEGUME	ROOT VEG.	GARDEN FRUIT	CORN/ GRAIN	PEANUTS
			<<	A V E R A G E S		>>		
<D&M>								
Adlt	22.831	2.782	3.340	8.412	2.140	5.405	27.843	0
Chld	10.034	0.485	1.295	3.262	0.668	1.669	15.354	0
<AGR.>								
Adlt	22.831	2.782	3.340	8.412	2.140	5.405	134.51	4.043
Chld	10.034	0.485	1.295	3.262	0.668	1.669	64.823	2.208
			<<	F R A C T I O N S		>>		
D&M	0.450	0.600	0.600	0.170	0.600	0.600	0.600	0
AGR.	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 3) << R A M M S >>

****** MEAN DAILY INTAKE OF ANIMAL TISSUE BY ADULT HUMAN ******

	BEEF	BEEF LIVER	POULTRY	PORK	LAMB	DAIRY	EGGS
INORGANICS :	56.173	1.837	10.969	32.700	0.675	83.171	11.467
ORGANICS :	26.979	0.394	1.835	19.252	0.344	30.148	1.321
FRACTIONS :	0.440	0.440	0.340	0.440	0.440	0.400	0.480

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 4) << R A M M S >>

****** MEAN DAILY INTAKE OF ANIMAL TISSUE BY ADULT HUMAN ******

	BEEF	BEEF LIVER	POULTRY	PORK	LAMB	DAIRY	EGGS
INORGANICS :	56.173	1.837	10.969	32.700	0.675	83.171	11.467
ORGANICS :	26.979	0.394	1.835	19.252	0.344	30.148	1.321
FRACTIONS :	0.440	0.440	0.340	0.440	0.440	0.400	0.480

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

```
(PATHWAY 11)          <<  R A M M S  >>                    ( BROWSE )

        SURFACE RUNOFF PARAMETERS FOR INVERSE CALCULATION
                        SCREEN 1 OF 2

Sludge Management Area                          =    80   (ha)
Soil/Sludge Bulk Density                        =   1.2   (g/cu cm)
SCS Runoff Curve Number                         =    80
Cover Management Factor                         =   0.3   (dimensionless)
Time Elapsed Since Beginning of Operation       =    30   (yrs)
Soil Erodibility Factor                         =  0.33   (tons/ft/ton-inch)
Lumped Zero-order Loss Rate                     =     0   (kg/ha-yr)
Buffer Zone Length                              =  1000   (cm)
Slope Length Factor                             =  1.70   (dimensionless)

     << Use Arrow Keys ↑ ↓ or ←┘ to Move Between Fields >>
  << [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>
```

```
(PATHWAY 11)          <<  R A M M S  >>

        SURFACE RUNOFF PARAMETERS FOR INVERSE CALCULATION
                        SCREEN 2 OF 2

Supporting Practice Factor                      =   0.5   (dimensionless)
Rainfall/Runoff Factor                          =   450   (ft-ton-in/acre/yr)
Recharge Rate                                   =    25   (cm/yr)
Storm Rainfall Depth                            =     1   (cm)
Single/Repeat Application Scenario              =     2
Soil/Sludge Available Water Content             =  0.15   (dimensionless)
Storm Rainfall Duration                         =     1   (hrs)
Event Receiving Water Flow Rate                 =     1   (cu m/sec)
Long-term Receiving Water Flow Rate             =     1   (cu m/sec)

     << Use Arrow Keys ↑ ↓ or ←┘ to Move Between Fields >>
  << [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>
```

In the next screens for Pathway 12, the system will require additional data to perform computation for the selected pathways. This data is site-specific and you should provide the data from your site (if available). If the data is not available, the system will prompt you with the default parameter data. The screens for Pathway 12 are presented in the next four screens:

(PATHWAY 12) << R A M M S >>

SELECTION OF MATERIAL TYPE/LAYERS

1 - CLAY	7 - SILTY LOAM
2 - SILTY CLAY	8 - SANDY LOAM
3 - SILTY CLAY LOAM	9 - LOAMY SAND
4 - CLAY LOAM	10 - SAND
5 - SANDY CLAY LOAM	11 - FRACTURED SANDSTONE
6 - SANDY SILT LOAM	12 - FRACTURED LIMESTONE

ENTER NUMBER OF LAYERS(maximum 5): 1

	1ST	2ND	3RD	4TH	5TH
ENTER TYPE OF MATERIAL(1-12) :	8	0	0	0	0
ENTER THICKNESS OF MATERIAL(m):	1.0	5.0	5.0	5.0	5.0

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 12) << R A M M S >>

GROUNDWATER PARAMETERS
SCREEN 1 OF 3

	LAYER MATERIAL TYPE	HYDRAULIC CONDUCTIVITY (m/day)	B	SATURATED MOISTURE CONTENT (cu m/cu m)	EFFECTIVE BULK DENSITY (kg/cu m)	FRAC. OF ORGANIC CARBON
1)	SANDY LOAM	100.0	6.3	0.36	1700	0.005
2)						
3)						
4)						
5)						

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

(PATHWAY 12) << R A M M S >>

GROUNDWATER PARAMETERS(SCREEN 2 OF 3)

Application Period	=	30	(yrs)
Sludge Moisture Content	=	.95	(kg/kg)
Sludge Storage Capacity	=	.9	(kg/kg)
Net Recharge	=	.25	(m/yr)
Distance From Area Boundary To Monitoring Location	=	1	(m)
Application Area Width	=	400	(m)
Application Area Length	=	2000	(m)
Average Surface Wind Velocity	=	1	(m/s)
UDX	=	.1	(m)

<< [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>

```
(PATHWAY 12)              <<   R A M M S   >>

                    GROUNDWATER PARAMETERS
                        SCREEN 3 OF 3

        ENTER THE GROUNDWATER PH AND EH CATEGORY. IF THE
        ACTUAL PH AND EH LEVEL IS NOT LISTED THEN SELECT
        THE LOWER PH VALUE AND THE HIGHER EH VALUE.

                        1 - PH 6.0, EH -200
                        2 - PH 6.0, EH +150
                        3 - PH 6.0, EH +500
                        4 - PH 7.0, EH -200
                        5 - PH 7.0, EH +150
                        6 - PH 7.0, EH +500
                        7 - PH 8.1, EH -206
                        8 - PH 8.1, EH +106

                    ENTER PH AND EH CATEGORY(1-8): 3

    << [PgDn] or [PgUp] to Next or Previous Screen; [ESC] to Exit >>
```

After you have provided the appropriate data for your site, the system has obtained all the information required for computation. It will proceed to prompt you for an output device selection as in the following screen:

E. Output Devices

```
              RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
                          MUNICIPAL SLUDGE

                      **** OUTPUT SELECTION ****

              OUTPUT RESULTS TO SCREEN ONLY. . . . . . . . 0
              OUTPUT RESULTS TO SCREEN/PRINTER . . . . . . 1
              OUTPUT RESULTS TO SCREEN/DISK. . . . . . . . 2
              OUTPUT RESULTS TO SCREEN/PRINTER/DISK. . . . 3

                 ENTER DESIRED SELECTION AND HIT [PgDn] 1
```

The system has the capability to display results to the monitor screen, printer, disk, and any combination of these devices as presented in the screen above. To keep the device requirement at a minimum, the results are transmitted with a 72-column format and appropriate screen/printer page breaks.

If you would like the results displayed on the screen only, enter **[0] [PgDn]** and the system will display results to the monitor screen. If you would like to have the results printed or sent to a disk, or both, select **[1] [PgDn]**, **[2] [PgDn]**, or **[3] [PgDn]** and the system will transmit the results to the screen and then to the printer or disk (or both) with the proper page breaks. If you selected to send the output results to a disk, the system will proceed first as in previously and will then prompt you for a filename and store the output on disk under the name you designate.

Following the selection of display, the system will display application rates on the screen as in the next two screens.

APPLICATION RATES(KG/HA)

<< AGRICULTURE >>

RISK LEVEL = 0.000100

POLL	CUMULATIVE APPLICATION(PATH)	ANNUAL APPLICATION(PATH)
A/D		+1.64E-02(9)
AS	+1.40E+01(2)	+0.35E+00(12)
BAP		+0.13E+00(12)
CD	+1.69E+01(10)	+1.34E+00(12)
CLD		+1.20E+00(12)
CR	+2.00E+02(7)	+0.96E+00(12)
CU	+4.60E+01(7)	+4.16E+01(12)
DDT		+5.47E-03(3)
DNI		+3.90E-02(12)
HEPC		+7.29E-02(4)
HG	+1.10E+01(3)	+0.35E+00(12)
HXBE		+4.35E-02(3)
HXBU		+0.34E+00(4)

-- More --

LIN		+4.61E+00(4)
MO	+1.69E+00(5)	
NI	+7.80E+01(7)	+3.58E+01(12)
PB	+7.73E+01(9)	+1.03E+01(12)
PCB		+5.64E-03(3)
SE	+2.52E+01(5)	
TCE		+1.28E-02(12)
TOX		+4.83E-02(12)
ZN	+1.72E+02(7)	+5.00E+02(12)

SLUDGE CONCENTRATIONS(MG/KG)

<< AGRICULTURE >>

SLUDGE APPLICATION RATES(MT/YR)

	1	5	10	50
A/D	1.64E+01	3.28E+00	1.64E+00	0.33E+00
BAP	1.34E+02	2.68E+01	1.34E+01	2.68E+00

-- More --

BAP	1.34E+02	2.68E+01	1.34E+01	2.68E+00

-- More --

CLD	1.20E+03	2.40E+02	1.20E+02	2.40E+01
DDT	5.47E+00	1.09E+00	0.55E+00	0.11E+00
DNI	3.90E+01	7.80E+00	3.90E+00	0.78E+00
HEPC	7.29E+01	1.46E+01	7.29E+00	1.46E+00
HXBE	4.35E+01	8.70E+00	4.35E+00	0.87E+00
HXBU	3.39E+02	6.78E+01	3.39E+01	6.78E+00
LIN	4.61E+03	9.22E+02	4.61E+02	9.22E+01
PCB	5.64E+00	1.13E+00	0.56E+00	0.11E+00
TCE	1.28E+01	2.55E+00	1.28E+00	0.26E+00
TOX	4.83E+01	9.67E+00	4.83E+00	0.97E+00

HIT RETURN TO CONTINUE?

Following the **[Return]** command, the system will ask you if you would like to list the input parameter values used for this run as in the following screen.

```
<< List input parameter values used for this run(Y/N) >> ?
```

Following the above selection, the system will ask you the printer selection as in the following screen.

```
RISK ASSESSMENT MODELS FOR LAND APPLICATION OF
MUNICIPAL SLUDGE

                **** PRINTER SELECTION ****

        1) HP LASERJET,+ W/FONT CARTRIDGE A,B,C,F,G,L,Y,Z
        2) HP LASERJET SERIES II
        3) EPSON FX-180,185,286
        4) CITIZEN MSP-10,15
        5) OTHER PRINTERS

          ENTER DESIRED SELECTION AND HIT [PgDn] 2
```

After determining the type of printer you have, you can select a printer compatible with the printer selection on the screen above and enter **[desired selection number] [PgDn]**.

1. Output Screens

If you answer **[Y]** for yes to the question of listing the input parameter values used in this run, the program will send the input variables as displayed in the following eight pages. The program will then send the application rates to the previously selected output. If the answer to the question above is **[N]** for no, the program will send just the application rates to the previously selected output.

INPUT PARAMETERS FOR << AGRICULTURE >>

Annual sludge application rate	5000	kg dry wt/ha	Upper depth of surface area	15	cm
Body weight (adult)	70	kg	Body weight (child)	10	kg
Year of exposure	5	years	Lifetime	70	years
Sludge ingested per day	0.1	g/day	Soil ingested per day	0.1	g/day
Relative effectiveness	1.0		Risk level	0.0001	
Period of gardening used	20	years	Fract. of diet. intake(sludge)-animal(<30 days)	0.08	
Fract. of diet. intake(sludge)-animal(>=30 days)	0.08		Fract. of diet. intake(sludge)-human	0.10	
Sludge management area	80	ha	Soil/Sludge bulk density	1.2	g/cu cm
SCS runoff curve number	80		Cover management factor	0.3	
Time elapsed since beginning of operation	30	yrs	Soil erodibility factor	0.33	tons/ft/ton-inch
Lumped zero-order loss rate	0	kg/ha-yr	Buffer zone length	1000	cm
Slope length factor	1.70		Supporting practice factor	0.50	
Rainfall/Runoff factor	450	ft-ton-in/acre/yr	Recharge rate	25	cm/yr
Storm rainfall depth	1	cm	Single/Repeat application scenario	2	
Soil/Sludge available water content	0.15		Storm rainfall duration	1	hrs
Event receiving water flow rate	1	cu m/sec	Long-term receiving water flow rate	1	cu m/sec
Number of layers of material type	1		Layer material type (1st)	8	SANDY LOAM
Thickness of material (1st)	1.0	m	Hydraulic conductivity (1st)	100.0	m/day
B (1st)	6.3		Saturated moisture content (1st)	0.36	
Effective bulk density (1st)	1700	kg/cu m	Fraction of organic carbon (1st)	0.005	
Application period	30	yrs	Sludge moisture content	.95	kg/kg
Sludge storage capacity	.9	kg/kg	Net recharge	.25	m/yr
Distance from area bound. to monit. location	1	m	Application area width	400	m
Application area length	2000	m	Average surface wind velocity	1	m/s
UDX	.1	m	PH and EH category	3	

INPUT PARAMETERS FOR << AGRICULTURE >>

**** DAILY INTAKE OF VEGETABLE ****

	POTATO	LEAFY VEG.	F. LEGUME	D. LEGUME	ROOT VEG.	GARDEN FRUIT	CORN/ GRAIN	PEANUT
Averages - D&M Adult :	22.831	2.782	3.340	8.412	2.140	5.405	27.843	0
Averages - D&M Child :	10.034	0.485	1.295	3.262	0.668	1.669	15.354	0
Averages - AGR Adult :	22.831	2.782	3.340	8.412	2.140	5.405	134.51	4.043
Averages - AGR Child :	10.034	0.485	1.295	3.262	0.668	1.669	64.823	2.208
Fractions - D&M :	0.450	0.600	0.600	0.170	0.600	0.600	0.600	0
Fractions - AGR :	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025

**** MEAN DAILY INTAKE OF ANIMAL TISSUE **** BY ADULT HUMAN

	BEEF	BEEF LIVER	POULTRY	PORK	LAMB	DAIRY	EGGS
Pathway 3 - INORGANICS :	56.174	1.837	10.969	32.700	0.675	83.171	11.467
Pathway 3 - ORGANICS :	26.979	0.394	1.835	19.252	0.344	30.148	1.321
Pathway 3 - FRACTIONS :	0.440	0.440	0.340	0.440	0.440	0.400	0.480
Pathway 4 - INORGANICS :	56.174	1.837	10.969	32.700	0.675	83.171	11.467
Pathway 4 - ORGANICS :	26.979	0.394	1.835	19.252	0.344	30.148	1.321
Pathway 4 - FRACTIONS :	0.440	0.440	0.000	0.000	0.440	0.400	0.000

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	ADULT DAILY BACKGROUND INTAKE (mg/day)	ACCEPTABLE DAILY INTAKE (mg/kg/day)	CHILD DAILY BACKGROUND INTAKE (mg/day)	HUMAN CANCER POTENCY 1/(mg/kg/day)	BACKGROUND SOIL CONCENTRATION (mg/day)	OVERALL 1ST. ORDER RATE FOR REMOVAL (per year)	HERBIVORE TOXIC THRESH. FEED CONC. (ug/g)	BACKGROUND FEED CONCENTRATION (ug/g)	MEAN SLOPE OF UPTAKE CURVE FOR PLANT (for path 3)	PREDATOR TOX. THRES. FEED CONC. FOR SC (ug/g)	BACKGROUND SOIL BIOTA CONCENTRATION (ug/g)
A/D	0		0	17	0	.692			0.02	1.7	.59
AS	.057	0.0014	0.013		3	-1					
BAP	0		0	11.5	0	3.65					
CD	0.033	0.001	0.013		.2	-1			0.10	6	4.8
CLD	0		0	1.3	0	0.583			0.63		
CR					100	-1					
CU					19	-1	25	2.1			
DDT	0		0	0.34	0	0			0.61		
DNI						5.11					
HEPC	0		0	9.1	0	.692			0.036		
HG	0.006	0.0003	0.001		0.1	-1			0.04		
HXBE	0		0	1.67	0	0.165			0.25		
HXBU	0		0	0.0775	0	0					
LIN	0		0	1.33	0	0.657					
MO					2	-1					
NI	0.4	0.02	0.135		18	-1					
PB	0	.002	0		11	-1				39.6	18.9
PCB	0		0	7.7	0	0.116			0.25		
SE	0.141	0.0045	0.052		0.21	-1			.09		
TCE	0		0	0.011	0	0					
TOX	0		0	1.13	0	0.063			.88		
ZN	18	0.47	7.8		54	-1			.97	894	228

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	MEAN SLOPE OF UPTAKE CURVE FOR SOIL	PHYTOTOXIC THRES. SOIL CONCENTRATION (ug/g)	SOIL BIOTA TOXIC THRES. SOIL CONC. (ug/g)	CARCINOGEN OR NONCARCINOGEN INDICATOR	HERBIVORE TOXIC THRES. FEED CONC. (ug/g)	BACKGROUND PLANT CONC. OR ORGANICS (ug/g)	SLOPE OF UPTAKE CURVE POTATOES (D & M)	SLOPE OF UPTAKE CURVE LEAFY VEG. (D & M)	SLOPE OF UPTAKE CURVE F. LEGUME (D & M)	SLOPE OF UPTAKE CURVE D. LEGUME (D & M)	SLOPE OF UPTAKE CURVE ROOT VEG. (D & M)
A/D	67.7			C			0.1300	0.2000	0.8100	0.8100	0.4300
AS				N			0.0006	0.0400	0.0002	0.0002	0.0200
BAP				C			0.4200	0.2900	0.4200	0.4200	0.4100
CD	2.3	89.4		N	5	0.09	0.0300	0.4300	0.0100	0.0100	0.2200
CLD				C							
CR		365		N							
CU		42	131	N	25	2.1					
DDT				C			0.0700	0.1100	0.0400	0.0400	0.1100
DNI				C							
HEPC				C			0.3000	0.0200	0.0400	0.0400	2.7100
HG				N			0.0033	0.0070	0.0010	0.0010	0.0170
HXBE				C			0.7500	0.5600	0.7800	0.7800	1.1100
HXBU				C							
LIN				C							
MO				N	5	1.1					
NI		57		N			0.1250	0.0900	0.1300	0.1300	0.5200
PB	0.33			N			0.0008	0.0080	0.0010	0.0010	0.0030
PCB				C			0.0200	0.3800	0.0020	0.0020	0.3600
SE				N	2.30	0.03	0.0200	0.0700	0.0200	0.0200	0.0400
TCE				C							
TOX				C			0.2700	0.0700	0.0700	0.0700	1.7300
ZN	2.95	140		N	300.00	26.0	0.0200	0.8000	0.0400	0.0400	0.0500

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	SLOPE OF UPTAKE CURVE GARDEN FRUIT (D & M)	SLOPE OF UPTAKE CURVE CORN/GRAIN (D & M)	MEAN SLOPE OF UPTAKE CURVE BEEF (for path 3)	MEAN SLOPE OF UPTAKE CURVE BEEF LIVER (for path 3)	MEAN SLOPE OF UPTAKE CURVE POULTRY (for path 3)	MEAN SLOPE OF UPTAKE CURVE PORK (for path 3)	MEAN SLOPE OF UPTAKE CURVE LAMB (for path 3)	MEAN SLOPE OF UPTAKE CURVE DAIRY (for path 3)	MEAN SLOPE OF UPTAKE CURVE EGGS (for path 3)	MEAN SLOPE OF UPTAKE CURVE BEEF (for path 4)	MEAN SLOPE OF UPTAKE CURVE BEEF LIVER (for path 4)
A/D	0.2200	0.0200	2.670	0.140	44.070	1.170	2.240	5.540	11.950	2.670	0.140
AS	0.0020	0.0001									
BAP	0.4200	0.4200									
CD	0.0500	0.0300	.0005	0.0022	0.0024	0.0015	0.00002	.00043	0.00088	.0005	0.0022
CLD			0.040	0.040	0.040	0.040	0.040	0.220	0.040	0.040	0.040
CR											
CU											
DDT	0.1100	0.5100	4.570	4.570	5.000	3.770	3.110	3.770	5.000	4.570	4.570
DNI											
HEPC	0.2100	0.1400	4.940	4.940	3.550	4.190	4.190	4.270	3.550	4.940	4.940
HG	0.0033	0.0033	0.002	0.020	2.330	0.019	0.0014	0.007	2.880	0.002	0.020
HXBE	0.7800	0.7800	3.000	3.000	5.900	4.600	7.000	3.200	3.30	3.000	3.000
HXBU										2.480	2.480
LIN										0.480	0.480
MO											
NI	0.0400	0.1300									
PB	0.0020	0.0100									
PCB	0.0200	0.0000	4.000	4.000	4.000	4.000	4.000	4.800	4.000	4.000	4.000
SE	0.0400	0.0300	0.550	0.420	0.550	0.280	0.550	0.550	0.550		
TCE											
TOX	0.0700	0.0700	0.850	0.850	0.790	0.790	0.740	0.020	0.790	0.850	0.850
ZN	0.0400	0.0400	0	0	0.020	0	1.100	0	0.020		

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	MEAN SLOPE OF UPTAKE CURVE POULTRY (for path 4)	MEAN SLOPE OF UPTAKE CURVE PORK (for path 4)	MEAN SLOPE OF UPTAKE CURVE LAMB (for path 4)	MEAN SLOPE OF UPTAKE CURVE DAIRY (for path 4)	MEAN SLOPE OF UPTAKE CURVE EGGS (for path 4)	INHALABLE PARTICULATE AIR CONC. (g/m3)	REFERENCE INHALABLE AIR CONC. (mg/m3)	SLOPE OF UPTAKE CURVE POTATOES (agri.)	SLOPE OF UPTAKE CURVE LEAFY VEG. (agri.)	SLOPE OF UPTAKE CURVE F. LEGUME (agri.)	SLOPE OF UPTAKE CURVE D. LEGUME (agri.)
A/D	44.070	1.170	2.240	5.540	11.950	0	0.150	0.1300	0.2000	0.8100	0.8100
AS						0.0014	0.002	0.0006	0.0400	0.0002	0.0002
BAP						0	0	0.4200	0.2900	0.4200	0.4200
CD	0.0024	0.0015	0.00002	.00043	0.00088	0.002	0.040	0.0300	0.3800	0.0100	0.0100
CLD	0.040	0.040	0.040	0.220	0.040	0	0				
CR							0.025				
CU							0				
DDT	5.000	3.770	3.110	3.770	5.000	0	0.500	0.0700	0.1100	0.0400	0.0400
DNI											
HEPC	3.550	4.190	4.190	4.270	3.550	0	0	0.3000	0.0200	0.0400	0.0400
HG	2.330	0.019	.0014	0.007	2.880	0.0003	0.050	0.0033	0.0071	0.0010	0.0010
HXBE	5.900	4.600	7.000	3.200	3.300	0	0	0.7500	0.5600	0.7800	0.7800
HXBU	2.480	2.480	2.480	2.480	2.480	0	0				
LIN	0.600	0.600	0.480	0.480	0.600	0	0				
MO						NA	0				
NI						0.02	0.015	0.0440	0.0900	0.0400	0.0400
PB						.02	0.050	0.0008	0.0060	0.0010	0.0010
PCB	4.000	4.000	4.000	4.800	4.000	0	0.001	0.0008	0.3800	0.0020	0.0020
SE						0.0045	0	0.0200	0.0700	0.0200	0.0200
TCE						0	0				
TOX	0.790	0.790	0.740	0.020	0.790	0	0	0.2700	0.0700	0.0700	0.0700
ZN						0.47	0	0.0600	0.2700	0.0500	0.0500

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	SLOPE OF UPTAKE CURVE ROOT VEG. (agri.)	SLOPE OF UPTAKE CURVE GARDEN FRUIT (agri.)	SLOPE OF UPTAKE CURVE CORN/GRAIN (agri.)	SLOPE OF UPTAKE CURVE PEANUTS (agri.)	INITIAL SLUDGE CONCENTRATION (mg/kg)	PARTITION COEFFICIENT FOR ABSORPTION (cm3/g)	MAXIMUM ALLOWABLE CONC. LEVEL (mg/l)	MEAN SLOPE OF UPTAKE CURVE FOR PLANT (for path 5)	MAXIMUM ALLOWABLE CONC. LEVEL (mg/l)	MAXIMUM ALLOWABLE CONC. LEVEL (mg/l)	MAXIMUM ALLOWABLE CONC. LEVEL (mg/l)
A/D	0.4300	0.2200	0.0300	0.8100	0.0882	23	0.0000071	0	.000071	.00000071	.000000071
AS	0.0200	0.0020	0.0004	0.0002	19.8	19.4	0.00022	0	.0022	.000022	.0000022
BAP	0.6100	0.4200	0.4200	0.4200	0.505	27500	0.00028	0	.0028	.000028	.0000028
CD	0.2200	0.0500	0.0160	0.0100	84.1	423	0.0011	0.10	.0011	.0001	.00001
CLD					0.0888	850	0.0000043	0	.0000043	.0000043	.00000043
CR					1190	56.5	0.011	0	.011	.011	.011
CU					1224	92.2	0.012	0.15	.012	.012	.012
DDT	0.1100	0.1100	0.4800	0.0400	0.249	25000	0.000001	0	.000001	.00000024	.000000024
DNI					0.87	.0002	0.00014	0	.001	.000014	.0000014
HEPC	2.7100	0.2100	0.1400	0.0400	0.0888	46	0.0000038	0	.0000038	.0000028	.00000028
HG	0.0170	0.0033	0.0010	0.0010	6.27	580	0.0001	0	.000012	.000012	.000012
HXBE	1.1100	0.7800	0.7800	0.7800	0.699	20	0.000072	0	.00072	.0000072	.00000072
HXBU					0.03	38	0.0093	0	.0093	.0045	.00045
LIN					0.0888	5.4	0.00008	0	.00008	.00008	.00008
MO					35.6	43.4	0	0.769			
NI	0.0300	0.0300	0.0400	0.0400	365	58.6	0.0134	0	.0134	.0134	.0134
PB	0.0030	0.0020	0.0100	0.0010	927	597	0.032	0	.0032	.0032	.0005
PCB	0.3600	0.0200	0.0000	0.0010	0.0888	1600	0.0000079	0	.000014	.00000079	.000000079
SE	0.0400	0.0400	0.0300	0.0200	8.52	14.9	0.0276	0.07	.005	.005	.005
TCE					14.0	0.99	0.27	0	2.7	.027	.0027
TOX	1.7300	0.0700	0.0700	0.0700	0.0888	4.80	0.0000002	0	.0000002	.0000002	.0000002
ZN	0.0500	0.0400	0.0300	0.0500	4199	939	0.11	0.058	.11	.11	.11

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	CONCENTRATION (for path 12) (mg/kg)	EFFECTS LEVEL (mg/l)	CARBON DIST. COEFFICIENT FOR ORGANICS	BACKGROUND CONCENTRATION (mg/l)
A/D			0	0
AS	753.5	0.05	0	0.0004
BAP	26.8	0.0003	5500000	0
CD	1330.0	0.01	0	0.001
CLD	240.3	0.00269	170000	0
CR	100000.	0.05	0	0.0014
CU	100000.	1.3	0	0.01
DDT	911.3	0.0102	5000000	0
DNI	8.934	0.0001	0.04	0
HEPC			0	0
HG	345.1	0.002	0	0.0003
HXBE			0	0
HXBU			0	0
LIN	100000.	0.004	1080.	0
MO			0	0
NI	35940.	1.75	0	0.0027
PB	18190.	0.05	0	0.001
PCB	40.56	0.00045	320000	0
SE			0	0
TCE	4.97	0.005	198	0
TOX	553.5	0.005	960	0
ZN	100000.	16.45	0	0.02

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APPLICATION RATES(KG/HA)

<< AGRICULTURE >>

PATHWAYS

	1A	10	2	3	4	5	6	7	8	9	10	11	12	LIMITING CUMULATIVE APPLICATION (PATHWAY)	LIMITING ANNUAL APPLICATION (PATHWAY)
A/D	0.78E+00	2.17E+00	2.62E+02	0.15E+00	4.41E-02					1.64E-02	3.00E+04	0.29E+00			1.64E-02(9)
AS	6.96E+03	3.82E+02	1.40E+01											1.40E+01(2)	
BAP	0.83E+00	6.49E+06	2.00E+09									5.19E+01	0.13E+00		0.13E+00(12)
CD	3.09E+02	1.84E+01		5.80E+03	2.60E+04	4.91E+01		1.78E+02						1.84E+01(1D)	
CLD			1.76E+03	2.25E+00	1.59E+01							0.14E+00	1.20E+00		0.14E+00(11)
CR								5.30E+02						5.30E+02(7)	
CU						1.53E+02	4.58E+02	4.60E+01	2.24E+02					4.60E+01(7)	
DDT	0.27E+00	4.62E-02	9.30E+00	5.47E-03	4.60E-02						1.00E+05	5.04E-03	4.34E+00		5.04E-03(11)
DNI												4.83E+04	3.90E-02		3.90E-02(12)
HEPC	0.98E+00	2.51E+00		0.15E+00	7.30E-02							0.15E+00			7.30E-02(4)
HG	2.00E+03	1.10E+02	3.98E+01	1.49E+01	1.00E+03									1.49E+01(3)	
HXBE	0.37E+00	0.10E+00	5.90E+01	3.84E-02	0.17E+00							1.14E+00			3.84E-02(3)
HXBU			4.08E+01		0.34E+00							6.09E+01			0.34E+00(4)
LIN					4.61E+00							3.96E+00	7.32E+01		3.96E+00(11)
NO						5.07E+00								5.07E+00(5)	
NI	5.34E+03	2.06E+02						7.80E+01						7.80E+01(7)	
PB	1.19E+03	1.95E+02	3.78E+02							1.25E+02				1.25E+02(9)	
PCB	4.14E+00	0.26E+00	7.26E+00	5.64E-03	1.92E-02						2.00E+02	8.06E-02	0.20E+00		5.64E-03(3)
SE	1.31E+03	1.62E+02		4.66E+01		3.24E+01								3.24E+01(5)	
TCE												1.99E+04	1.28E-02		1.28E-02(12)
TOX	1.51E+00	0.16E+00	2.16E+01	4.92E-02	0.75E+00							4.33E-03	4.83E-02		4.33E-03(11)
ZN	8.20E+04	5.87E+03		3.00E+04		4.72E+03		1.72E+02		4.52E+02				1.72E+02(7)	

The table in the output screen above presents the application rates for each contaminant and pathway first. After determining the limiting cumulative application pathway and the limiting annual application pathway for each contaminant, the system presents these on the right of the table with the limiting pathway number in parentheses.

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SLUDGE CONCENTRATIONS(MG/KG)

<< AGRICULTURE >>

SLUDGE APPLICATION RATES(MT/YR)

	1	3	5	10	15	20	25	30	35	40	45	50
A/D	1.64E+01	5.47E+00	3.28E+00	1.64E+00	1.09E+00	0.82E+00	0.66E+00	0.55E+00	0.47E+00	0.41E+00	0.36E+00	0.33E+00
BAP	1.34E+02	4.47E+01	2.68E+01	1.34E+01	8.93E+00	6.70E+00	5.36E+00	4.47E+00	3.83E+00	3.35E+00	2.98E+00	2.68E+00
CLD	1.42E+02	4.75E+01	2.85E+01	1.42E+01	9.49E+00	7.12E+00	5.70E+00	4.75E+00	4.07E+00	3.56E+00	3.16E+00	2.85E+00
DDT	5.04E+00	1.68E+00	1.01E+00	0.50E+00	0.34E+00	0.25E+00	0.20E+00	0.17E+00	0.14E+00	0.13E+00	0.11E+00	0.10E+00
DNI	3.90E+01	1.30E+01	7.80E+00	3.90E+00	2.60E+00	1.95E+00	1.56E+00	1.30E+00	1.11E+00	0.97E+00	0.87E+00	0.78E+00
HEPC	7.30E+01	2.43E+01	1.46E+01	7.30E+00	4.87E+00	3.65E+00	2.92E+00	2.43E+00	2.09E+00	1.83E+00	1.62E+00	1.46E+00
HXBE	3.84E+01	1.28E+01	7.68E+00	3.84E+00	2.56E+00	1.92E+00	1.54E+00	1.28E+00	1.10E+00	0.96E+00	0.85E+00	0.77E+00
HXBU	3.39E+02	1.13E+02	6.78E+01	3.39E+01	2.26E+01	1.70E+01	1.36E+01	1.13E+01	9.69E+00	8.48E+00	7.53E+00	6.78E+00
LIN	3.96E+03	1.32E+03	7.91E+02	3.96E+02	2.64E+02	1.98E+02	1.58E+02	1.32E+02	1.13E+02	9.89E+01	8.79E+01	7.91E+01
PCB	5.64E+00	1.88E+00	1.13E+00	0.56E+00	0.38E+00	0.28E+00	0.23E+00	0.19E+00	0.16E+00	0.14E+00	0.13E+00	0.11E+00
TCE	1.28E+01	4.25E+00	2.55E+00	1.28E+00	0.85E+00	0.64E+00	0.51E+00	0.43E+00	0.36E+00	0.32E+00	0.28E+00	0.26E+00
TOX	4.33E+00	1.44E+00	0.87E+00	0.43E+00	0.29E+00	0.22E+00	0.17E+00	0.14E+00	0.12E+00	0.11E+00	9.62E-02	8.66E-02

In the output screen above, the system presents limiting annual application rates determined in the previous table with sludge application rates for contaminants. This allows you to select application rates for given limiting annual application rates for contaminants and pathways. At the completion of output production, the system will go back to the tiers/pathway selection screen. You may initiate execution of additional tier/pathway data management or computation by selecting the tier/pathway and depressing **[PgDn]** or **[Esc]** to exit from the system.

IV. EXAMPLE CALCULATIONS

A. TIERED APPLICATIONS

1. Agriculture (Pathways 1A,1D,2,3,4,5,6,7,8,9,10,11,12)

APPLICATION RATES(KG/HA)

<< AGRICULTURE >>

	PATHWAYS												LIMITING CUMULATIVE APPLICATION (PATHWAY)	LIMITING ANNUAL APPLICATION (PATHWAY)
	1A	1D	2	3	4	5	6	7	8	9	10	11	12	
A/D	0.78E+00	2.17E+00	2.62E+02	0.15E+00	4.41E-02					1.64E-02	3.00E+04	0.29E+00		1.64E-02(9)
AS	6.96E+03	3.82E+02	1.40E+01											1.40E+01(2)
BAP	0.83E+00	6.49E+06	2.00E+09											
CD	3.09E+02	1.84E+01		5.80E+03	2.60E+04	4.91E+01		1.78E+02				5.19E+01	0.13E+00	0.13E+00(12)
CLD			1.76E+03	2.25E+00	1.59E+01									1.84E+01(1D)
CR								5.30E+02				0.14E+00	1.20E+00	0.14E+00(11)
CU						1.53E+02	4.58E+02	4.60E+01	2.24E+02					5.30E+02(7)
DDT	0.27E+00	4.62E-02	9.30E+00	5.47E-03	4.60E-02									4.60E+01(7)
DNI											1.00E+05	5.04E-03	4.34E+00	5.04E-03(11)
HEPC	0.98E+00	2.51E+00		0.15E+00	7.30E-02							4.83E+04	3.90E-02	3.90E-02(12)
HG	2.00E+03	1.10E+02	3.98E+01	1.49E+01	1.00E+03							0.15E+00		7.30E-02(4)
HXBE	0.37E+00	0.10E+00	5.90E+01	3.84E-02	0.17E+00									1.49E+01(3)
HXBU			4.08E+01		0.34E+00							1.14E+00		3.84E-02(3)
LIN					4.61E+00							6.09E+01		0.34E+00(4)
MO						5.07E+00						3.96E+00	7.32E+01	3.96E+00(11)
NI	5.34E+03	2.06E+02						7.80E+01						5.07E+00(5)
PB	1.19E+03	1.95E+02	3.78E+02							1.25E+02				7.80E+01(7)
PCB	4.14E+00	0.26E+00	7.26E+00	5.64E-03	1.92E-02						2.00E+02	8.06E-02	0.20E+00	1.25E+02(9)
SE	1.31E+03	1.62E+02		4.66E+01		3.24E+01								5.64E-03(3)
TCE														3.24E+01(5)
TOX	1.51E+00	0.16E+00	2.16E+01	4.92E-02	0.75E+00							1.99E+04	1.28E-02	1.28E-02(12)
ZN	8.20E+04	5.87E+03		3.00E+04		4.72E+03		1.72E+02		4.52E+02		4.33E-03	4.83E-02	4.33E-03(11)
														1.72E+02(7)

SLUDGE CONCENTRATIONS(MG/KG)

<< AGRICULTURE >>

SLUDGE APPLICATION RATES(MT/YR)

	1	3	5	10	15	20	25	30	35	40	45	50
A/D	1.64E+01	5.47E+00	3.28E+00	1.64E+00	1.09E+00	0.82E+00	0.66E+00	0.55E+00	0.47E+00	0.41E+00	0.36E+00	0.33E+00
BAP	1.34E+02	4.47E+01	2.68E+01	1.34E+01	8.93E+00	6.70E+00	5.36E+00	4.47E+00	3.83E+00	3.35E+00	2.98E+00	2.68E+00
CLD	1.42E+02	4.75E+01	2.85E+01	1.42E+01	9.49E+00	7.12E+00	5.70E+00	4.75E+00	4.07E+00	3.56E+00	3.16E+00	2.85E+00
DDT	5.04E+00	1.68E+00	1.01E+00	0.50E+00	0.34E+00	0.25E+00	0.20E+00	0.17E+00	0.14E+00	0.13E+00	0.11E+00	0.10E+00
DNI	3.90E+01	1.30E+01	7.80E+00	3.90E+00	2.60E+00	1.95E+00	1.56E+00	1.30E+00	1.11E+00	0.97E+00	0.87E+00	0.78E+00
HEPC	7.30E+01	2.43E+01	1.46E+01	7.30E+00	4.87E+00	3.65E+00	2.92E+00	2.43E+00	2.09E+00	1.83E+00	1.62E+00	1.46E+00
HXBE	3.84E+01	1.28E+01	7.68E+00	3.84E+00	2.56E+00	1.92E+00	1.54E+00	1.28E+00	1.10E+00	0.96E+00	0.85E+00	0.77E+00
HXBU	3.39E+02	1.13E+02	6.78E+01	3.39E+01	2.26E+01	1.70E+01	1.36E+01	1.13E+01	9.69E+00	8.48E+00	7.53E+00	6.78E+00
LIN	3.96E+03	1.32E+03	7.91E+02	3.96E+02	2.64E+02	1.98E+02	1.58E+02	1.32E+02	1.13E+02	9.89E+01	8.79E+01	7.91E+01
PCB	5.64E+00	1.88E+00	1.13E+00	0.56E+00	0.38E+00	0.28E+00	0.23E+00	0.19E+00	0.16E+00	0.14E+00	0.13E+00	0.11E+00
TCE	1.28E+01	4.25E+00	2.55E+00	1.28E+00	0.85E+00	0.64E+00	0.51E+00	0.43E+00	0.36E+00	0.32E+00	0.28E+00	0.26E+00
TOX	4.33E+00	1.44E+00	0.87E+00	0.43E+00	0.29E+00	0.22E+00	0.17E+00	0.14E+00	0.12E+00	0.11E+00	9.62E-02	8.66E-02

INPUT PARAMETERS FOR << AGRICULTURE >>

Annual sludge application rate	5000	kg dry wt/ha	Upper depth of surface area	15	cm
Body weight (adult)	70	kg	Body weight (child)	10	kg
Year of exposure	5	years	Lifetime	70	years
Sludge ingested per day	0.1	g/day	Soil ingested per day	0.1	g/day
Relative effectiveness	1.0		Risk level	0.0001	
Period of gardening used	20	years	Fract. of diet. intake(sludge)-animal(<30 days)	0.08	
Fract. of diet. intake(sludge)-animal(>=30 days)	0.08		Fract. of diet. intake(sludge)-human	0.10	
Sludge management area	80	ha	Soil/Sludge bulk density	1.2	g/cu cm
SCS runoff curve number	80		Cover management factor	0.3	
Time elapsed since beginning of operation	30	yrs	Soil erodibility factor	0.33	tons/ft/ton-inch
Lumped zero-order loss rate	0	kg/ha-yr	Buffer zone length	1000	cm
Slope length factor	1.70		Supporting practice factor	0.50	
Rainfall/Runoff factor	450	ft-ton-in/acre/yr	Recharge rate	25	cm/yr
Storm rainfall depth	1	cm	Single/Repeat application scenario	2	
Soil/Sludge available water content	0.15		Storm rainfall duration	1	hrs
Event receiving water flow rate	1	cu m/sec	Long-term receiving water flow rate	1	cu m/sec
Number of layers of material type	1		Layer material type (1st)	8	SANDY LOAM
Thickness of material (1st)	1.0	m	Hydraulic conductivity (1st)	100.0	m/day
B (1st)	6.3		Saturated moisture content (1st)	0.36	
Effective bulk density (1st)	1700	kg/cu m	Fraction of organic carbon (1st)	0.005	
Application period	30	yrs	Sludge moisture content	.95	kg/kg
Sludge storage capacity	.9	kg/kg	Net recharge	.25	m/yr
Distance from area bound. to monit. location	1	m	Application area width	400	m
Application area length	2000	m	Average surface wind velocity	1	m/s
UDX	.1	m	PH and EH category	3	

INPUT PARAMETERS FOR << AGRICULTURE >>

**** DAILY INTAKE OF VEGETABLE ****

	POTATO	LEAFY VEG.	F. LEGUME	D. LEGUME	ROOT VEG.	GARDEN FRUIT	CORN/ GRAIN	PEANUT
Averages - D&M Adult :	22.831	2.782	3.340	8.412	2.140	5.405	27.843	0
Averages - D&M Child :	10.034	0.485	1.295	3.262	0.668	1.669	15.354	0
Averages - AGR Adult :	22.831	2.782	3.340	8.412	2.140	5.405	134.51	4.043
Averages - AGR Child :	10.034	0.485	1.295	3.262	0.668	1.669	64.823	2.208
Fractions - D&M :	0.450	0.600	0.600	0.170	0.600	0.600	0.600	0
Fractions - AGR :	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025

**** MEAN DAILY INTAKE OF ANIMAL TISSUE ****
BY ADULT HUMAN

	BEEF	BEEF LIVER	POULTRY	PORK	LAMB	DAIRY	EGGS
Pathway 3 - INORGANICS :	56.174	1.837	10.969	32.700	0.675	83.171	11.467
Pathway 3 - ORGANICS :	26.979	0.394	1.835	19.252	0.344	30.148	1.321
Pathway 3 - FRACTIONS :	0.440	0.440	0.340	0.440	0.440	0.400	0.480
Pathway 4 - INORGANICS :	56.174	1.837	10.969	32.700	0.675	83.171	11.467
Pathway 4 - ORGANICS :	26.979	0.394	1.835	19.252	0.344	30.148	1.321
Pathway 4 - FRACTIONS :	0.440	0.440	0.000	0.000	0.440	0.400	0.000

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	ADULT DAILY BACKGROUND INTAKE (mg/day)	ACCEPTABLE DAILY INTAKE (mg/kg/day)	CHILD DAILY BACKGROUND INTAKE (mg/day)	HUMAN CANCER POTENCY 1/(mg/kg/day)	BACKGROUND SOIL CONCENTRATION (mg/day)	OVERALL 1ST. ORDER RATE FOR REMOVAL (per year)	HERBIVORE TOXIC THRESH. FEED CONC. (ug/g)	BACKGROUND FEED CONCENTRATION (ug/g)	MEAN SLOPE OF UPTAKE CURVE FOR PLANT (for path 3)	PREDATOR TOX. THRES. FEED CONC. FOR SC (ug/g)	BACKGROUND SOIL BIOTA CONCENTRATION (ug/g)
A/D	0		0	17	0	.692			0.02	1.7	.59
AS	.057	0.0014	0.013		3	-1					
BAP	0		0	11.5	0	3.65					
CD	0.033	0.001	0.013		.2	-1			0.10	6	4.8
CLD	0		0	1.3	0	0.583			0.63		
CR					100	-1					
CU					19	-1	25	2.1			
DDT	0		0	0.34	0	0			0.61		
DNI						5.11					
HEPC	0		0	9.1	0	.692			0.036		
HG	0.006	0.0003	0.001		0.1	-1			0.04		
HXBE	0		0	1.67	0	0.165			0.25		
HXBU	0		0	0.0775	0	0					
LIN	0		0	1.33	0	0.657					
MO					2	-1					
NI	0.4	0.02	0.135		18	-1					
PB	0	.002	0		11	-1				39.6	18.9
PCB	0		0	7.7	0	0.116			0.25		
SE	0.141	0.0045	0.052		0.21	-1			.09		
TCE	0		0	0.011	0	0					
TOX	0		0	1.13	0	0.063			.88		
ZN	18	0.47	7.8		54	-1			.97	894	228

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	MEAN SLOPE OF UPTAKE CURVE FOR SOIL	PHYTOTOXIC THRES. SOIL CONCENTRATION (ug/g)	SOIL BIOTA TOXIC THRES. SOIL CONC. (ug/g)	CARCINOGEN OR NONCARCINOGEN INDICATOR	HERBIVORE TOXIC THRES. FEED CONC. (ug/g)	BACKGROUND PLANT CONC. OR ORGANICS (ug/g)	SLOPE OF UPTAKE CURVE POTATOES (D & M)	SLOPE OF UPTAKE CURVE LEAFY VEG. (D & M)	SLOPE OF UPTAKE CURVE F. LEGUME (D & M)	SLOPE OF UPTAKE CURVE D. LEGUME (D & M)	SLOPE OF UPTAKE CURVE ROOT VEG. (D & M)
A/D	67.7			C			0.1300	0.2000	0.8100	0.8100	0.4300
AS				N			0.0006	0.0400	0.0002	0.0002	0.0200
BAP				C			0.4200	0.2900	0.4200	0.4200	0.6100
CD	2.3	89.4		N	5	0.09	0.0300	0.4300	0.0100	0.0100	0.2200
CLD				C							
CR		365		N							
CU		42	131	N	25	2.1					
DDT				C			0.0700	0.1100	0.0400	0.0400	0.1100
DNI				C							
HEPC				C			0.3000	0.0200	0.0400	0.0400	2.7100
HG				N			0.0033	0.0070	0.0010	0.0010	0.0170
HXBE				C			0.7500	0.5600	0.7800	0.7800	1.1100
HXBU				C							
LIN				C							
MO				N	5	1.1					
NI		57		N			0.1250	0.0900	0.1300	0.1300	0.5200
PB	0.33			N			0.0008	0.0080	0.0010	0.0010	0.0030
PCB				C			0.0200	0.3800	0.0020	0.0020	0.3600
SE				N	2.30	0.03	0.0200	0.0700	0.0200	0.0200	0.0400
TCE				C							
TOX				C			0.2700	0.0700	0.0700	0.0700	1.7300
ZN	2.95	140		N	300.00	26.0	0.0200	0.8000	0.0400	0.0400	0.0500

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	SLOPE OF UPTAKE CURVE GARDEN FRUIT (D & M)	SLOPE OF UPTAKE CURVE CORN/GRAIN (D & M)	MEAN SLOPE OF UPTAKE CURVE BEEF (for path 3)	MEAN SLOPE OF UPTAKE CURVE BEEF LIVER (for path 3)	MEAN SLOPE OF UPTAKE CURVE POULTRY (for path 3)	MEAN SLOPE OF UPTAKE CURVE PORK (for path 3)	MEAN SLOPE OF UPTAKE CURVE LAMB (for path 3)	MEAN SLOPE OF UPTAKE CURVE DAIRY (for path 3)	MEAN SLOPE OF UPTAKE CURVE EGGS (for path 3)	MEAN SLOPE OF UPTAKE CURVE BEEF (for path 4)	MEAN SLOPE OF UPTAKE CURVE BEEF LIVER (for path 4)
A/D	0.2200	0.0200	2.670	0.140	44.070	1.170	2.240	5.540	11.950	2.670	0.140
AS	0.0020	0.0001									
BAP	0.4200	0.4200									
CD	0.0500	0.0300	.0005	0.0022	0.0024	0.0015	0.00002	.00043	0.00088	.0005	0.0022
CLD			0.040	0.040	0.040	0.040	0.040	0.220	0.040	0.040	0.040
CR											
CU											
DDT	0.1100	0.5100	4.570	4.570	5.000	3.770	3.110	3.770	5.000	4.570	4.570
DNI											
HEPC	0.2100	0.1400	4.940	4.940	3.550	4.190	4.190	4.270	3.550	4.940	4.940
HG	0.0033	0.0033	0.002	0.020	2.330	0.019	0.0014	0.007	2.880	0.002	0.020
HXBE	0.7800	0.7800	3.000	3.000	5.900	4.600	7.000	3.200	3.30	3.000	3.000
HXBU										2.480	2.480
LIN										0.480	0.480
MO											
NI	0.0400	0.1300									
PB	0.0020	0.0100									
PCB	0.0200	0.0000	4.000	4.000	4.000	4.000	4.000	4.800	4.000	4.000	4.000
SE	0.0400	0.0300	0.550	0.420	0.550	0.280	0.550	0.550	0.550		
TCE											
TOX	0.0700	0.0700	0.850	0.850	0.790	0.790	0.740	0.020	0.790	0.850	0.850
ZN	0.0400	0.0400	0	0	0.020	0	1.100	0	0.020		

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	MEAN SLOPE OF UPTAKE CURVE POULTRY (for path 4)	MEAN SLOPE OF UPTAKE CURVE PORK (for path 4)	MEAN SLOPE OF UPTAKE CURVE LAMB (for path 4)	MEAN SLOPE OF UPTAKE CURVE DAIRY (for path 4)	MEAN SLOPE OF UPTAKE CURVE EGGS (for path 4)	INHALABLE PARTICULATE AIR CONC. (g/m3)	REFERENCE INHALABLE AIR CONC. (mg/m3)	SLOPE OF UPTAKE CURVE POTATOES (agri.)	SLOPE OF UPTAKE CURVE LEAFY VEG. (agri.)	SLOPE OF UPTAKE CURVE F. LEGUME (agri.)	SLOPE OF UPTAKE CURVE D. LEGUME (agri.)
A/D	44.070	1.170	2.240	5.540	11.950	0	0.150	0.1300	0.2000	0.8100	0.8100
AS						0.0014	0.002	0.0006	0.0400	0.0002	0.0002
BAP						0	0	0.4200	0.2900	0.4200	0.4200
CD	0.0024	0.0015	0.00002	.00043	0.00088	0.002	0.040	0.0300	0.3800	0.0100	0.0100
CLD	0.040	0.040	0.040	0.220	0.040	0	0				
CR							0.025				
CU							0				
DDT	5.000	3.770	3.110	3.770	5.000	0	0.500	0.0700	0.1100	0.0400	0.0400
DNI											
HEPC	3.550	4.190	4.190	4.270	3.550	0	0	0.3000	0.0200	0.0400	0.0400
HG	2.330	0.019	.0014	0.007	2.880	0.0003	0.050	0.0033	0.0071	0.0010	0.0010
HXBE	5.900	4.600	7.000	3.200	3.300	0	0	0.7500	0.5600	0.7800	0.7800
HXBU	2.480	2.480	2.480	2.480	2.480	0	0				
LIN	0.600	0.600	0.480	0.480	0.600	0	0				
MO						NA	0				
NI						0.02	0.015	0.0440	0.0900	0.0400	0.0400
PB						.02	0.050	0.0008	0.0060	0.0010	0.0010
PCB	4.000	4.000	4.000	4.800	4.000	0	0.001	0.0008	0.3800	0.0020	0.0020
SE						0.0045	0	0.0200	0.0700	0.0200	0.0200
TCE						0	0				
TOX	0.790	0.790	0.740	0.020	0.790	0	0	0.2700	0.0700	0.0700	0.0700
ZN						0.47	0	0.0600	0.2700	0.0500	0.0500

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	SLOPE OF UPTAKE CURVE ROOT VEG. (agri.)	SLOPE OF UPTAKE CURVE GARDEN FRUIT (agri.)	SLOPE OF UPTAKE CURVE CORN/GRAIN (agri.)	SLOPE OF UPTAKE CURVE PEANUTS (agri.)	INITIAL SLUDGE CONCENTRATION (mg/kg)	PARTITION COEFFICIENT FOR ABSORPTION (cm3/g)	MAXIMUM ALLOWABLE CONC. LEVEL (mg/l)	MEAN SLOPE OF UPTAKE CURVE FOR PLANT (for path 5)	MAXIMUM ALLOWABLE CONC. LEVEL (mg/l)	MAXIMUM ALLOWABLE CONC. LEVEL (mg/l)	MAXIMUM ALLOWABLE CONC. LEVEL (mg/l)
A/D	0.4300	0.2200	0.0300	0.8100	0.0882	23	0.0000071	0	.000071	.00000071	.000000071
AS	0.0200	0.0020	0.0004	0.0002	19.8	19.4	0.00022	0	.0022	.000022	.0000022
BAP	0.6100	0.4200	0.4200	0.4200	0.505	27500	0.00028	0	.0028	.000028	.0000028
CD	0.2200	0.0500	0.0160	0.0100	84.1	423	0.0011	0.10	.0011	.0001	.00001
CLD					0.0888	850	0.0000043	0	.0000043	.0000043	.00000043
CR					1190	56.5	0.011	0	.011	.011	.011
CU					1224	92.2	0.012	0.15	.012	.012	.012
DDT	0.1100	0.1100	0.4800	0.0400	0.249	25000	0.000001	0	.000001	.00000024	.000000024
DNI					0.87	.0002	0.00014	0	.001	.000014	.0000014
HEPC	2.7100	0.2100	0.1400	0.0400	0.0888	46	0.0000038	0	.0000038	.0000028	.00000028
HG	0.0170	0.0033	0.0010	0.0010	6.27	580	0.0001	0	.000012	.000012	.000012
HXBE	1.1100	0.7800	0.7800	0.7800	0.699	20	0.000072	0	.00072	.0000072	.00000072
HXBU					0.03	38	0.0093	0	.0093	.0045	.00045
LIN					0.0888	5.4	0.00008	0	.00008	.00008	.00008
MO					35.6	43.4	0	0.769			
NI	0.0300	0.0300	0.0400	0.0400	365	58.6	0.0134	0	.0134	.0134	.0134
PB	0.0030	0.0020	0.0100	0.0010	927	597	0.032	0	.0032	.0032	.0005
PCB	0.3600	0.0200	0.0000	0.0010	0.0888	1600	0.0000079	0	.000014	.00000079	.000000079
SE	0.0400	0.0400	0.0300	0.0200	8.52	14.9	0.0276	0.07	.005	.005	.005
TCE					14.0	0.99	0.27	0	2.7	.027	.0027
TOX	1.7300	0.0700	0.0700	0.0700	0.0888	4.80	0.0000002	0	.0000002	.0000002	.0000002
ZN	0.0500	0.0400	0.0300	0.0500	4199	939	0.11	0.058	.11	.11	.11

INPUT PARAMETERS FOR << AGRICULTURE >>

POLLUTANT	CONCENTRATION (for path 12) (mg/kg)	EFFECTS LEVEL (mg/l)	CARBON DIST. COEFFICIENT FOR ORGANICS	BACKGROUND CONCENTRATION (mg/l)
A/D			0	0
AS	753.5	0.05	0	0.0004
BAP	26.8	0.0003	5500000	0
CD	1330.0	0.01	0	0.001
CLD	240.3	0.00269	170000	0
CR	100000.	0.05	0	0.0014
CU	100000.	1.3	0	0.01
DDT	911.3	0.0102	5000000	0
DNI	8.934	0.0001	0.04	0
HEPC			0	0
HG	345.1	0.002	0	0.0003
HXBE			0	0
HXBU			0	0
LIN	100000.	0.004	1080.	0
MO			0	0
NI	35940.	1.75	0	0.0027
PB	18190.	0.05	0	0.001
PCB	40.56	0.00045	320000	0
SE			0	0
TCE	4.97	0.005	198	0
TOX	553.5	0.005	960	0
ZN	100000.	16.45	0	0.02

2. Agriculture - Crops for Animal and Human Consumption (Pathways 1A,1D,2,3,5,7,8,9,10,11,12)

APPLICATION RATES(KG/HA)

<< AGRICULTURE - CROPS FOR ANIMAL AND HUMAN CONSUMPTION >>

	PATHWAYS											LIMITING CUMULATIVE APPLICATION (PATHWAY)	LIMITING ANNUAL APPLICATION (PATHWAY)
	1A	1D	2	3	5	7	8	9	10	11	12		
A/D	0.78E+00	2.17E+00	2.62E+02	0.15E+00				1.64E-02	3.00E+04	0.29E+00			1.64E-02(9)
AS	6.96E+03	3.82E+02	1.40E+01									1.40E+01(2)	
BAP	0.83E+00	6.49E+06	2.00E+09							5.19E+01	0.13E+00		0.83E+00(1A)
CD	3.09E+02	1.84E+01		5.80E+03	4.91E+01	1.78E+02						1.84E+01(1D)	
CLD			1.76E+03	2.25E+00						0.14E+00	1.20E+00		0.14E+00(11)
CR						5.30E+02						5.30E+02(7)	
CU					1.53E+02	4.60E+01	2.24E+02					4.60E+01(7)	
DDT	0.27E+00	4.62E-02	9.30E+00	5.47E-03					1.00E+05	5.04E-03	4.34E+00		5.04E-03(11)
DNI										4.83E+04	3.90E-02		4.83E+04(11)
HEPC	0.98E+00	2.51E+00		0.15E+00						0.15E+00			0.15E+00(3)
HG	2.00E+03	1.10E+02	3.98E+01	1.49E+01								1.49E+01(3)	
HXBE	0.37E+00	0.10E+00	5.90E+01	3.84E-02						1.14E+00			3.84E-02(3)
HXBU			4.08E+01							6.09E+01			4.08E+01(2)
LIN										3.96E+00	7.32E+01		3.96E+00(11)
MO					5.07E+00							5.07E+00(5)	
NI	5.34E+03	2.06E+02				7.80E+01						7.80E+01(7)	
PB	1.19E+03	1.95E+02	3.78E+02					1.25E+02				1.25E+02(9)	
PCB	4.14E+00	0.26E+00	7.26E+00	5.64E-03					2.00E+02	8.06E-02	0.20E+00		5.64E-03(3)
SE	1.31E+03	1.62E+02		4.66E+01	3.24E+01							3.24E+01(5)	
TCE										1.99E+04	1.28E-02		1.99E+04(11)
TOX	1.51E+00	0.16E+00	2.16E+01	4.92E-02						4.33E-03	4.83E-02		4.33E-03(11)
ZN	8.20E+04	5.87E+03		3.00E+04	4.72E+03	1.72E+02		4.52E+02				1.72E+02(7)	

SLUDGE CONCENTRATIONS(MG/KG)
<< AGRICULTURE - CROPS FOR ANIMAL AND HUMAN CONSUMPTION >>

SLUDGE APPLICATION RATES(MT/YR)

	1	3	5	10	15	20	25	30	35	40	45	50
A/D	1.64E+01	5.47E+00	3.28E+00	1.64E+00	1.09E+00	0.82E+00	0.66E+00	0.55E+00	0.47E+00	0.41E+00	0.36E+00	0.33E+00
BAP	8.30E+02	2.77E+02	1.66E+02	8.30E+01	5.54E+01	4.15E+01	3.32E+01	2.77E+01	2.37E+01	2.08E+01	1.85E+01	1.66E+01
CLD	1.42E+02	4.75E+01	2.85E+01	1.42E+01	9.49E+00	7.12E+00	5.70E+00	4.75E+00	4.07E+00	3.56E+00	3.16E+00	2.85E+00
DDT	5.04E+00	1.68E+00	1.01E+00	0.50E+00	0.34E+00	0.25E+00	0.20E+00	0.17E+00	0.14E+00	0.13E+00	0.11E+00	0.10E+00
DNI	4.83E+07	1.61E+07	9.66E+06	4.83E+06	3.22E+06	2.42E+06	1.93E+06	1.61E+06	1.38E+06	1.21E+06	1.07E+06	9.66E+05
HEPC	1.49E+02	4.98E+01	2.99E+01	1.49E+01	9.96E+00	7.47E+00	5.98E+00	4.98E+00	4.27E+00	3.74E+00	3.32E+00	2.99E+00
HXBE	3.84E+01	1.28E+01	7.68E+00	3.84E+00	2.56E+00	1.92E+00	1.54E+00	1.28E+00	1.10E+00	0.96E+00	0.85E+00	0.77E+00
HXBU	4.08E+04	1.36E+04	8.16E+03	4.08E+03	2.72E+03	2.04E+03	1.63E+03	1.36E+03	1.17E+03	1.02E+03	9.06E+02	8.16E+02
LIN	3.96E+03	1.32E+03	7.91E+02	3.96E+02	2.64E+02	1.98E+02	1.58E+02	1.32E+02	1.13E+02	9.89E+01	8.79E+01	7.91E+01
PCB	5.64E+00	1.88E+00	1.13E+00	0.56E+00	0.38E+00	0.28E+00	0.23E+00	0.19E+00	0.16E+00	0.14E+00	0.13E+00	0.11E+00
TCE	1.99E+07	6.63E+06	3.98E+06	1.99E+06	1.33E+06	9.95E+05	7.96E+05	6.63E+05	5.69E+05	4.97E+05	4.42E+05	3.98E+05
TOX	4.33E+00	1.44E+00	0.87E+00	0.43E+00	0.29E+00	0.22E+00	0.17E+00	0.14E+00	0.12E+00	0.11E+00	9.62E-02	8.66E-02

3. Agriculture - Pasture and Future Residential Use
(Pathways 1D,2,4,6,7,8,9,10,11,12)

APPLICATION RATES(KG/HA)

<< AGRICULTURE - PASTURE AND FUTURE RESIDENTIAL USE >>

	PATHWAYS										LIMITING CUMULATIVE APPLICATION (PATHWAY)	LIMITING ANNUAL APPLICATION (PATHWAY)
	1D	2	4	6	7	8	9	10	11	12		
A/D	6.81E-02	2.62E+02	1.33E+00				1.64E-02	3.00E+04	0.29E+00			1.64E-02(9)
AS	3.82E+02	1.40E+01									1.40E+01(2)	
BAP	7.70E-02	2.00E+09							5.19E+01	0.13E+00		7.70E-02(1D)
CD	1.84E+01		2.60E+04		1.78E+02						1.84E+01(1D)	
CLD		1.76E+03	2.80E+02						0.14E+00	1.20E+00		0.14E+00(11)
CR					5.30E+02						5.30E+02(7)	
CU				4.58E+02	4.60E+01	2.24E+02					4.60E+01(7)	
DDT	4.62E-02	9.30E+00	4.60E-02					1.00E+05	5.04E-03	4.34E+00		5.04E-03(11)
DNI									4.83E+04	3.90E-02		3.90E-02(12)
HEPC	7.90E-02		2.20E+00						0.15E+00			7.90E-02(1D)
HG	1.10E+02	3.98E+01	1.00E+03								3.98E+01(2)	
HXBE	4.57E-02	5.90E+01	0.39E+00						1.14E+00			4.57E-02(1D)
HXBU		4.08E+01	0.34E+00						6.09E+01			0.34E+00(4)
LIN			1.17E+02						3.96E+00	7.32E+01		3.96E+00(11)
MO												
NI	2.06E+02				7.80E+01						7.80E+01(7)	
PB	1.95E+02	3.78E+02					1.25E+02				1.25E+02(9)	
PCB	0.15E+00	7.26E+00	3.40E-02					2.00E+02	8.06E-02	0.20E+00		3.40E-02(4)
SE	1.62E+02										1.62E+02(1D)	
TCE									1.99E+04	1.28E-02		1.28E-02(12)
TOX	0.12E+00	2.16E+01	1.02E+00						4.33E-03	4.83E-02		4.33E-03(11)
ZN	5.87E+03				1.72E+02		4.52E+02				1.72E+02(7)	

SLUDGE CONCENTRATIONS(MG/KG)

<< AGRICULTURE - PASTURE AND FUTURE RESIDENTIAL USE >>

SLUDGE APPLICATION RATES(MT/YR)

	1	3	5	10	15	20	25	30	35	40	45	50
A/D	1.64E+01	5.47E+00	3.28E+00	1.64E+00	1.09E+00	0.82E+00	0.66E+00	0.55E+00	0.47E+00	0.41E+00	0.36E+00	0.33E+00
BAP	7.70E+01	2.57E+01	1.54E+01	7.70E+00	5.13E+00	3.85E+00	3.08E+00	2.57E+00	2.20E+00	1.92E+00	1.71E+00	1.54E+00
CLD	1.42E+02	4.75E+01	2.85E+01	1.42E+01	9.49E+00	7.12E+00	5.70E+00	4.75E+00	4.07E+00	3.56E+00	3.16E+00	2.85E+00
DDT	5.04E+00	1.68E+00	1.01E+00	0.50E+00	0.34E+00	0.25E+00	0.20E+00	0.17E+00	0.14E+00	0.13E+00	0.11E+00	0.10E+00
DNI	3.90E+01	1.30E+01	7.80E+00	3.90E+00	2.60E+00	1.95E+00	1.56E+00	1.30E+00	1.11E+00	0.97E+00	0.87E+00	0.78E+00
HEPC	7.90E+01	2.63E+01	1.58E+01	7.90E+00	5.27E+00	3.95E+00	3.16E+00	2.63E+00	2.26E+00	1.97E+00	1.76E+00	1.58E+00
HXBE	4.57E+01	1.52E+01	9.14E+00	4.57E+00	3.05E+00	2.28E+00	1.83E+00	1.52E+00	1.31E+00	1.14E+00	1.02E+00	0.91E+00
HXBU	3.39E+02	1.13E+02	6.78E+01	3.39E+01	2.26E+01	1.70E+01	1.36E+01	1.13E+01	9.69E+00	8.48E+00	7.53E+00	6.78E+00
LIN	3.96E+03	1.32E+03	7.91E+02	3.96E+02	2.64E+02	1.98E+02	1.58E+02	1.32E+02	1.13E+02	9.89E+01	8.79E+01	7.91E+01
PCB	3.40E+01	1.13E+01	6.80E+00	3.40E+00	2.27E+00	1.70E+00	1.36E+00	1.13E+00	0.97E+00	0.85E+00	0.76E+00	0.68E+00
TCE	1.28E+01	4.25E+00	2.55E+00	1.28E+00	0.85E+00	0.64E+00	0.51E+00	0.43E+00	0.36E+00	0.32E+00	0.28E+00	0.26E+00
TOX	4.33E+00	1.44E+00	0.87E+00	0.43E+00	0.29E+00	0.22E+00	0.17E+00	0.14E+00	0.12E+00	0.11E+00	9.62E-02	8.66E-02

4. Distribution and Marketing (D&M) (Pathways 1D,2,7,8,9,11)

APPLICATION RATES(KG/HA)

<< DISTRIBUTION AND MARKETING >>

	PATHWAYS						LIMITING CUMULATIVE APPLICATION (PATHWAY)	LIMITING ANNUAL APPLICATION (PATHWAY)
	1D	2	7	8	9	11		
A/D	6.81E-02	8.25E+00			1.64E-02	6.75E+01		1.64E-02(9)
AS	3.82E+02	1.40E+01					1.40E+01(2)	
BAP	7.70E-02	2.37E+01				1.25E+04		7.70E-02(1D)
CD	1.84E+01		1.78E+02				1.84E+01(1D)	
CLD		9.55E+01				3.22E+01		3.22E+01(11)
CR			5.30E+02				5.30E+02(7)	
CU			4.60E+01	2.24E+02			4.60E+01(7)	
DDT	4.62E-02	9.30E+00				0.81E+00		4.62E-02(1D)
DNI						1.18E+07		1.18E+07(11)
HEPC	7.90E-02					3.48E+01		7.90E-02(1D)
HG	1.10E+02	3.98E+01					3.98E+01(2)	
HXBE	4.57E-02	2.59E+01				2.38E+02		4.57E-02(1D)
HXBU		4.08E+01				1.05E+04		4.08E+01(2)
LIN						9.17E+02		9.17E+02(11)
MO								
NI	2.06E+02		7.80E+01				7.80E+01(7)	
PB	1.95E+02	3.78E+02			1.25E+02		1.25E+02(9)	
PCB	0.15E+00	4.06E+00				1.54E+01		0.15E+00(1D)
SE	1.62E+02						1.62E+02(1D)	
TCE						4.69E+06		4.69E+06(11)
TOX	0.12E+00	1.57E+01				0.94E+00		0.12E+00(1D)
ZN	5.87E+03		1.72E+02		4.52E+02		1.72E+02(7)	

SLUDGE CONCENTRATIONS(MG/KG)

<< DISTRIBUTION AND MARKETING >>

SLUDGE APPLICATION RATES(MT/YR)

	1	3	5	10	15	20	25	30	35	40	45	50
A/D	1.64E+01	5.47E+00	3.28E+00	1.64E+00	1.09E+00	0.82E+00	0.66E+00	0.55E+00	0.47E+00	0.41E+00	0.36E+00	0.33E+00
AS	7.00E+02	2.33E+02	1.40E+02	7.00E+01	4.67E+01	3.50E+01	2.80E+01	2.33E+01	2.00E+01	1.75E+01	1.56E+01	1.40E+01
BAP	7.70E+01	2.57E+01	1.54E+01	7.70E+00	5.13E+00	3.85E+00	3.08E+00	2.57E+00	2.20E+00	1.92E+00	1.71E+00	1.54E+00
CD	9.22E+02	3.07E+02	1.84E+02	9.22E+01	6.15E+01	4.61E+01	3.69E+01	3.07E+01	2.63E+01	2.31E+01	2.05E+01	1.84E+01
CLD	3.22E+04	1.07E+04	6.44E+03	3.22E+03	2.15E+03	1.61E+03	1.29E+03	1.07E+03	9.21E+02	8.05E+02	7.16E+02	6.44E+02
CR	2.65E+04	8.83E+03	5.30E+03	2.65E+03	1.77E+03	1.33E+03	1.06E+03	8.83E+02	7.57E+02	6.63E+02	5.89E+02	5.30E+02
CU	2.30E+03	7.67E+02	4.60E+02	2.30E+02	1.53E+02	1.15E+02	9.20E+01	7.67E+01	6.57E+01	5.75E+01	5.11E+01	4.60E+01
DDT	4.62E+01	1.54E+01	9.24E+00	4.62E+00	3.08E+00	2.31E+00	1.85E+00	1.54E+00	1.32E+00	1.16E+00	1.03E+00	0.92E+00
DNI	1.18E+10	3.92E+09	2.35E+09	1.18E+09	7.83E+08	5.88E+08	4.70E+08	3.92E+08	3.36E+08	2.94E+08	2.61E+08	2.35E+08
HEPC	7.90E+01	2.63E+01	1.58E+01	7.90E+00	5.27E+00	3.95E+00	3.16E+00	2.63E+00	2.26E+00	1.97E+00	1.76E+00	1.58E+00
HG	1.99E+03	6.63E+02	3.98E+02	1.99E+02	1.33E+02	9.95E+01	7.96E+01	6.63E+01	5.69E+01	4.98E+01	4.42E+01	3.98E+01
HXBE	4.57E+01	1.52E+01	9.14E+00	4.57E+00	3.05E+00	2.28E+00	1.83E+00	1.52E+00	1.31E+00	1.14E+00	1.02E+00	0.91E+00
HXBU	4.08E+04	1.36E+04	8.16E+03	4.08E+03	2.72E+03	2.04E+03	1.63E+03	1.36E+03	1.17E+03	1.02E+03	9.06E+02	8.16E+02
LIN	9.17E+05	3.06E+05	1.83E+05	9.17E+04	6.11E+04	4.59E+04	3.67E+04	3.06E+04	2.62E+04	2.29E+04	2.04E+04	1.83E+04
MO	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI	3.90E+03	1.30E+03	7.80E+02	3.90E+02	2.60E+02	1.95E+02	1.56E+02	1.30E+02	1.11E+02	9.75E+01	8.67E+01	7.80E+01
PB	6.27E+03	2.09E+03	1.25E+03	6.27E+02	4.18E+02	3.14E+02	2.51E+02	2.09E+02	1.79E+02	1.57E+02	1.39E+02	1.25E+02
PCB	1.48E+02	4.93E+01	2.96E+01	1.48E+01	9.86E+00	7.40E+00	5.92E+00	4.93E+00	4.23E+00	3.70E+00	3.29E+00	2.96E+00
SE	8.11E+03	2.70E+03	1.62E+03	8.11E+02	5.40E+02	4.05E+02	3.24E+02	2.70E+02	2.32E+02	2.03E+02	1.80E+02	1.62E+02
TCE	4.69E+09	1.56E+09	9.38E+08	4.69E+08	3.13E+08	2.34E+08	1.88E+08	1.56E+08	1.34E+08	1.17E+08	1.04E+08	9.38E+07
TOX	1.17E+02	3.89E+01	2.33E+01	1.17E+01	7.77E+00	5.83E+00	4.66E+00	3.89E+00	3.33E+00	2.91E+00	2.59E+00	2.33E+00
ZN	8.60E+03	2.87E+03	1.72E+03	8.60E+02	5.73E+02	4.30E+02	3.44E+02	2.87E+02	2.46E+02	2.15E+02	1.91E+02	1.72E+02

B. INDIVIDUAL PATHWAY APPLICATION

1A. Sludge-soil-plant-human toxicity (AGRICULTURE)

PATHWAY 1 - SLUDGE --> SOIL --> PLANT--> HUMAN (AGR)

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
A/D	----	----	+0.78E+00
AS	----	+6.96E+03	----
BAP	----	----	+0.83E+00
CD	----	+3.09E+02	----
DDT	----	----	+0.27E+00
HEPC	----	----	+0.98E+00
HG	----	+2.00E+03	----
HXBE	----	----	+0.37E+00
NI	----	+5.34E+03	----
PB	----	+1.19E+03	----
PCB	----	----	+4.14E+00
SE	----	+1.31E+03	----
TOX	----	----	+1.51E+00
ZN	----	+8.20E+04	----

1D. Sludge-soil-plant-human toxicity (D&M)

PATHWAY 1 - SLUDGE --> SOIL --> PLANT--> HUMAN (D&M)

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
A/D	----	----	+6.81E-02
AS	----	+3.82E+02	----
BAP	----	----	+7.70E-02
CD	----	+1.84E+01	----
DDT	----	----	+4.62E-02
HEPC	----	----	+7.90E-02
HG	----	+1.10E+02	----
HXBE	----	----	+4.57E-02
NI	----	+2.06E+02	----
PB	----	+1.95E+02	----
PCB	----	----	+0.15E+00
SE	----	+1.62E+02	----
TOX	----	----	+0.12E+00
ZN	----	+5.87E+03	----

2. Sludge-human toxicity (Child)

PATHWAY 2 - SLUDGE ---> HUMAN TOXICITY(CHILD)

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
A/D	----	----	+2.62E+02
AS	----	+1.40E+01	----
BAP	----	----	+2.00E+09
CD	----	***	----
CLD	----	----	+1.76E+03
DDT	----	----	+9.30E+00
HG	----	+3.98E+01	----
HXBE	----	----	+5.90E+01
HXBU	----	----	+4.08E+01
PB	----	+3.78E+02	----
PCB	----	----	+7.26E+00
TOX	----	----	+2.16E+01

3. Sludge-soil-plant-animal-human toxicity

PATHWAY 3 - SLUDGE --> SOIL --> PLANT --> ANIMAL --> HUMAN

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
A/D	----	----	+0.15E+00
CD	----	+5.80E+03	----
CLD	----	----	+2.25E+00
DDT	----	----	+5.47E-03
HEPC	----	----	+0.15E+00
HG	----	+1.49E+01	----
HXBE	----	----	+3.84E-02
PCB	----	----	+5.64E-03
SE	----	+4.66E+01	----
TOX	----	----	+4.92E-02
ZN	----	+3.00E+04	----

4. Sludge-animal (direct ingestion)-human toxicity

PATHWAY 4 - SLUDGE ---> ANIMAL ---> HUMAN

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
A/D	+5.51E-02	----	+4.41E-02
CD	+1.63E+04	+2.60E+04	----
CLD	+2.25E+01	----	+1.59E+01
DDT	+2.55E+00	----	+4.60E-02
HEPC	+9.12E-02	----	+7.30E-02
HG	+6.27E+02	+1.00E+03	----
HXBE	+0.70E+00	----	+0.17E+00
HXBU	+1.88E+01	----	+0.34E+00
LIN	+5.96E+00	----	+4.61E+00
PCB	+0.11E+00	----	+1.92E-02
TOX	+7.35E+00	----	+0.75E+00

5. Sludge-soil-plant-animal toxicity

PATHWAY 5 - SLUDGE --> SOIL --> PLANT --> ANIMAL

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
CD	----	+4.91E+01	----
CU	----	+1.53E+02	----
MO	----	+5.07E+00	----
SE	----	+3.24E+01	----
ZN	----	+4.72E+03	----

6. Sludge-animal toxicity (direct ingestion)

PATHWAY 6 - SLUDGE ---> SOIL ---> ANIMAL

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
CU	+2.86E+02	+4.58E+02	----

7. Sludge-soil-plant toxicity

PATHWAY 7 - SLUDGE --> SOIL --> PLANT TOXICITY

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
CD	----	+1.78E+02	----
CR	----	+5.30E+02	----
CU	----	+4.60E+01	----
NI	----	+7.80E+01	----
ZN	----	+1.72E+02	----

8. Sludge-soil-soil biota toxicity

PATHWAY 8 - SLUDGE --> SOIL --> SOIL BIOTA

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
CU	----	+2.24E+02	----

9. Sludge-soil-soil biota-predator toxicity

PATHWAY 9 - SLUDGE --> SOIL --> SOIL BIOTA --> SOIL BIOTA PREDATOR

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
A/D	----	----	+1.64E-02
PB	----	+1.25E+02	----
ZN	----	+4.52E+02	----

10. Particulate resuspension

PATHWAY 10 - ATMOSPHERE EMISSION OF SLUDGE AMENDED SOIL PARTICULATES

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
A/D	----	----	+3.00E+04
DDT	----	----	+1.00E+05
PCB	----	----	+2.00E+02

11. Surface runoff

PATHWAY 11 - SURFACE RUNOFF

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
A/D	+5.88E+01	----	+0.29E+00
BAP	+1.04E+04	----	+5.19E+01
CLD	+2.85E+01	----	+0.14E+00
DDT	+1.01E+00	----	+5.04E-03
DNI	+9.66E+06	----	+4.83E+04
HEPC	+3.03E+01	----	+0.15E+00
HXBE	+2.28E+02	----	+1.14E+00
HXBU	+1.22E+04	----	+6.09E+01
LIN	+7.91E+02	----	+3.96E+00
PCB	+1.61E+01	----	+8.06E-02
TCE	+3.98E+06	----	+1.99E+04
TOX	+0.87E+00	----	+4.33E-03

12. Groundwater

PATHWAY 12 - GROUNDWATER

	SLUDGE CONCENTRATION (PPM)	CUMULATIVE APPLICATION RATE(Kg/ha)	ANNUAL APPLICATION RATE(Kg/ha)
BAP	+2.68E+01	----	+0.13E+00
CLD	+2.40E+02	----	+1.20E+00
DDT	+8.67E+02	----	+4.34E+00
DNI	+7.80E+00	----	+3.90E-02
LIN	+1.46E+04	----	+7.32E+01
PCB	+4.02E+01	----	+0.20E+00
TCE	+2.55E+00	----	+1.28E-02
TOX	+9.67E+00	----	+4.83E-02

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